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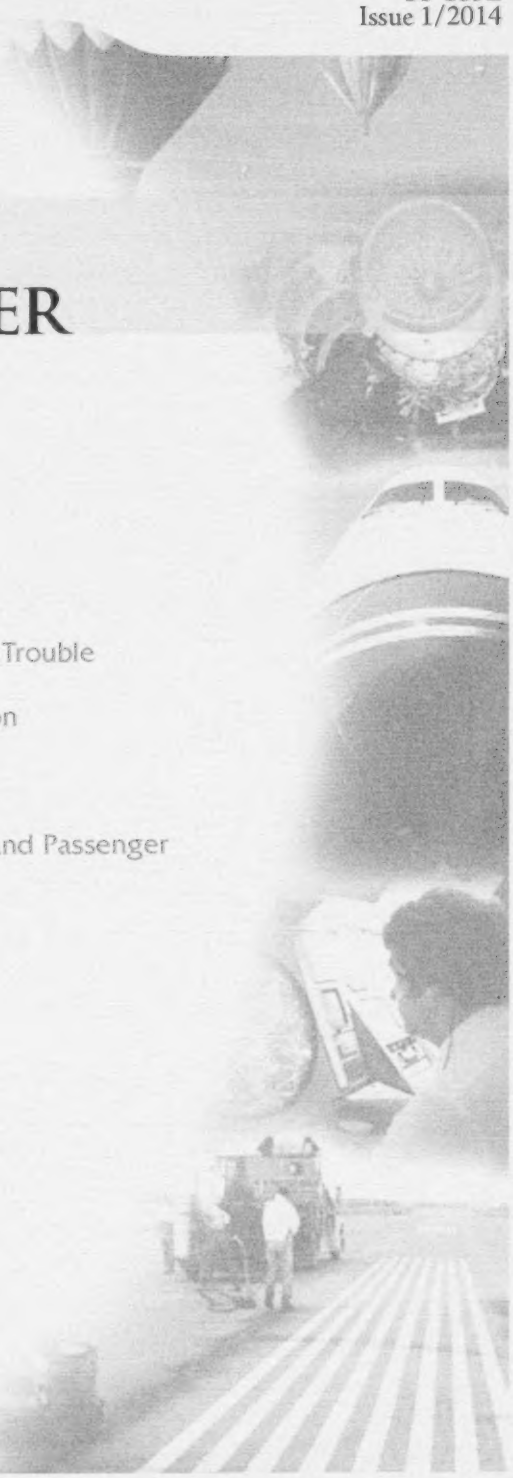
TP 185E
Issue 1/2014



AVIATION SAFETY LETTER

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Take Five... Passenger Safety Briefings

Learn from the mistakes of others;
you'll not live long enough to make them all yourself ...

Canada

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Sécurité aérienne — Nouvelles est la version française de cette publication.

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ISSN: 0709-8103
TP 185E

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PRE-FLIGHT

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COPA Corner: Flight Through Thunderstorms is Asking for Trouble

by Donald Anders Talleur. This article was originally published in the October 2010 issue of COPA Flight under the "Pilot's Primer" column.

I write this article shortly after Flight 8520, an AIRES Boeing 737, crashed while on approach to San Andres Island, a Colombian resort area. While the investigation of this crash is still ongoing[1], I feel compelled to focus on one prominent circumstance that could have played a role in bringing this aircraft to the ground prematurely.

According to all reports, Flight 8520 was flying through a thunderstorm during the approach to landing. While I do not intend to speculate on the particulars of this crash, its occurrence is a reminder that there are inherent dangers in attempting to fly through a thunderstorm, and it is those dangers that I'd like to address this month.

Thunderstorms contain some of the scariest weather known to man, and the danger of that weather is well known.

Wind shear, microbursts, hail, lightning and turbulence are the main hazards and exist in thunderstorms to varying degrees depending on the size and strength of the storm. I should point out that size and strength are generally synonymous in that a storm with very high tops is also generally capable of producing the worst weather.

Although wind shear and microbursts can occur independently of a thunderstorm, as "painted" on the radar, those associated with a thunderstorm frequently produce the most hazardous flight conditions.

There are a slew of accident cases that list wind shear/probable microburst as contributing to the ensuing loss of control. The typical situation is that an airplane gets into a wind shear situation close to the ground during approach to landing. A sudden shift in headwind component means a loss of indicated airspeed.

On final approach, the margin between indicated and minimum safe flying speed is small, so any sudden loss of airspeed often signals the need for immediate action on the pilot's part. Failure to react quickly can result in a stall or even premature ground contact. Typically, wind shear close to the ground does not exceed 20 kt, so it can usually be "powered" out of. That being said, if a report for wind shear exists, extreme caution should be taken when attempting a landing in such conditions.

If wind shear is encountered during landing or takeoff, the airspeed loss or gain and the altitude of occurrence should be reported to ATC.

While wind shear is relatively common, a less common type of wind shear event is the microburst. If there can be a worst-case wind shear scenario, I'd have to say that a microburst is it. Years ago, I saw what a microburst could do when one hit a small airport northwest of the Chicago, Ill. area.

The damage was amazing. If it hadn't been classified as a microburst, I might have suspected a mini-tornado. Tied down airplanes were uprooted, and one was even found upside down on top of a nearby hangar. A nearby barn was flattened. Now picture yourself trying to fly through something that could do all of that!

Several airliners have tried over the years and failed miserably. An L-1011 crash at Dallas/Fort Worth a bunch of years ago was tragic testimony that a microburst can bring down the largest of aircraft.

Since then, some pretty smart folks in the U.S. have looked into the microburst phenomenon and made startling findings. They found that microbursts are a whole lot more common than anyone had previously thought.

1 The final occurrence report into the AIRES Flight 8520 accident has been released by Colombian authorities since the original publication of this article. The probable cause of the accident was: "Execution of the flight below the angle of approach, due to a misjudgment of the crew, believing to be much higher, leading the aircraft to fly a typical trajectory of a 'black hole' illusion, which was experienced during the night-time approach to a runway with low contrast surrounded in bright focused lights, aggravated by bad weather of heavy rain." (from the Aviation Safety Network's Web page on Flight 8520)

Through the use of sophisticated measuring equipment they mapped out microburst activity at and near major airports across the U.S. and came to the conclusion that microbursts are possible anywhere there is convective activity (i.e. thunderstorms).

Although many microbursts were of an intensity that a large airplane might make it through, many more were of an intensity greater than what brought down that L-1011. While I won't go into the gory details of how a microburst works in this article, it's clear that the name of the game is to avoid microbursts in the first place. The best way to do that is to stay away from thunderstorms.

Another hazardous feature of thunderstorms is turbulence. Although generally brief, turbulence in a thunderstorm can be quite violent. The combination of updrafts, downdrafts, swirling and shifting patterns of air within a thunderstorm can lead to turbulence that is too difficult for even a jetliner to traverse.

Case in point, just today there was news of a jetliner on the east coast of the U.S. that diverted for landing after encountering severe turbulence in or near a thunderstorm. This is exactly the type of weather event that should be avoided if possible.

However, the major difficulty in avoiding turbulence is due to the difficulty of accurately predicting its whereabouts. Luckily, with the advent of Doppler radar, air currents likely to produce turbulent conditions are more easily identifiable. Still, air current activity in a thunderstorm changes frequently, making precise predictions impossible.

As a result of the somewhat stealthy nature of turbulence, as a general rule, expect it anywhere near or within a thunderstorm.

One inevitability is where there's a thunderstorm, there's lightning. This point is academic since to have thunder there must be a preceding bolt of lightning. Lightning is rarely accused of bringing down airplanes these days (although it has happened and will probably happen in the future) owing to advances in the bonding of aircraft structures to facilitate the better distribution of the charge and subsequent discharge back into the air. At worst, airliners generally suffer nonstructural issues such as nose cone or wing tip damage, but there have been a few suspected cases where a strike led to a fuel tank rupture and tragic results.

Newer aircraft with composite structures present new problems in that a strike can lead to delamination of material near the strike zone as well as the conventional damage expected at the discharge point(s). Since there is really no way to know how a given aircraft will react to a strike, the best solution is to stay at least 10 mi. clear of thunderstorms. Why so far, you might ask? Simple! Lightning need not stay in the cloud, and if your airplane is a convenient object to attract the strike, then... tag—you're it!

One last serious hazard, as if the others weren't bad enough already, is hail. Imagine your friend throwing ice cubes at you from a distance of 10 ft. It probably won't kill you, but if he throws them hard enough, expect some small bruises. Now imagine him throwing those cubes at you at 200 kt. Ouch!

A jetliner flying through hail won't "feel" much better, and the Internet is full of interesting pictures of damage caused by relatively short encounters with hail. Busted or completely shredded nose cones, busted windshields, leading edge damage that will make you think the airplane flew through a baseball factory; these are serious problems to be sure.

The damage to a small airplane can be equally as bad even though the speed is usually much lower. Slower aircraft will be slower to exit the hail and that means more time for damage.

So how does a pilot avoid hail? Well, for starters, never fly under anything that looks like the anvil of a thunderstorm, and also don't fly through the vertical thunderstorm cloud. Although hail falls in relatively predictable areas of a storm, a pilot does not generally have the information available during flight to select the right path. Also, although you might fly in the clear air below an anvil, it may be difficult or impossible to spot hail falling prior to running into it.

If I've scared you enough to keep you out of thunderstorms then I'd say this article has been a success. These weather phenomena are serious hazards to all aircraft and should be avoided at all costs. Don't believe that just because someone you know made it through a storm, that it's possible to do so on a regular basis.

The only way an airplane makes it through a full-blown thunderstorm unscathed is by luck. Don't get me wrong, luck is good, but if you're not the type to gamble your entire life savings on a card game, then you might just want to wait out that thunderstorm. The odds of winning the card game are probably better than winning a bout with a thunderstorm. △

This month's Pilot Primer is written by Donald Anders Talleur, an Assistant Chief Flight Instructor at the University of Illinois, Institute of Aviation. He holds a joint appointment with the Professional Pilot Division and Human Factors Division. He has been flying since 1984 and, in addition to flight instructing since 1990, has worked on numerous research contracts for the FAA, Air Force, Navy, NASA and Army. He has authored or co-authored over 200 aviation-related papers and articles and has an M.S. degree in Engineering Psychology, specializing in Aviation Human Factors.

2013 David Charles Abramson Memorial (DCAM) Flight Instructor Safety Award

The recipient of the 2013 DCAM Flight Instructor Safety Award is Chris Walsh of Moncton Flight College (MFC), Moncton, N.B. The award was presented to Mr. Walsh by award co-founder and national administrator Jane Abramson on November 18, 2013, at the Air Transport Association of Canada (ATAC) Annual General Meeting and Tradeshow in Montréal, Que.

Chris Walsh made a significant contribution to the development and management of MFC's approved training organization and the subsequent launch of the multi-crew pilot licence. He has consistently demonstrated high levels of professionalism, commitment and acute understanding of the complexities of operating a flight training unit in a safe and productive environment.

Two deserving nominees were also recognized for their professionalism: Heather Philpott, assistant chief flying instructor at Gander Flight Training, Gander, Nfld., and Deanna Wiebe, assistant professor of aviation at Mount Royal University, Calgary, Alta. Both received courtesy attendance to professional development workshops.

In addition, a new legacy award was created in 2013, which will be awarded on an ad hoc basis to deserving flight training builders. Orville Hewitt, chief flight instructor at Cooking Lake Aviation Academy, Sherwood Park, Alta., was chosen to receive this special honour. Mr. Hewitt has created a significant training and instruction history and was honoured with a special DCAM plaque and an engraved aviator watch.

Left to right: Jane Abramson, Chris Walsh and Orville Hewitt at the DCAM Award presentation ceremony in Montreal, Que. (Photo: Mike Doiron)

The annual DCAM Award promotes flight safety by recognizing exceptional flight instructors in Canada and has brought recognition and awareness to the flight instructor community. The deadline for nominations for the 2014 award is September 14, 2014. For details, please visit www.dcamaward.com. △

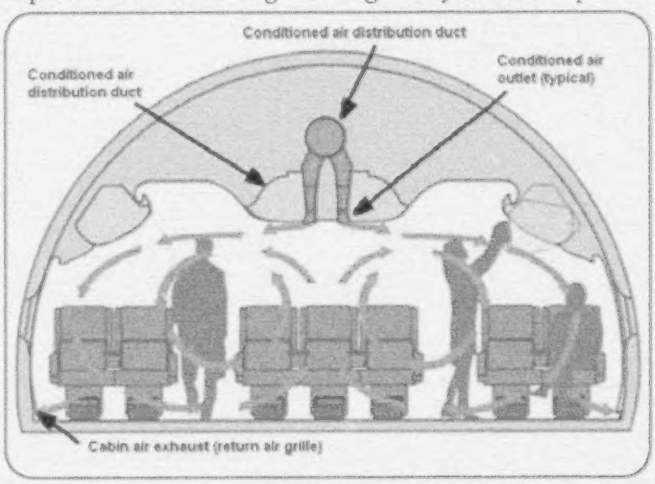
Pandemic and Communicable Diseases—Spread Prevention

by the Civil Aviation Contingency Operations Division, National Operations, Civil Aviation, Transport Canada

Have you ever sat on a crowded flight surrounded by individuals who are repeatedly coughing or look feverish? Considering the air inside the aircraft cabin is recycled and that it could potentially be carrying airborne germs from one person to another, you wonder if the government has something in place to prevent diseases from spreading by airplane.

Framework

Transport Canada (TC) Civil Aviation Contingency Operations (CACO) focuses on contingency operations and emergency planning. The objectives of the TC Civil Aviation plans are to provide for the coordination and assessment of information related to a pandemic's impact on the National Civil Air Transportation System (NCATS); monitor the ongoing safety of the NCATS; support an expeditious recovery of the NCATS; outline possible regulatory actions appropriate to the issues arising during an event; address business continuity issues related to the availability of TC personnel; and support other departments in executing their regulatory duties. As part of


Conditioned air distribution duct
Conditioned air distribution duct
Conditioned air outlet (typical)
Cabin air exhaust (return air grille)

Aircraft air flow

emergency preparedness, CACO develops and maintains the *Plan for Pandemics and Communicable Disease Events* under the authority of the Minister of Transport. CACO updates these plans on behalf of the Director General, Civil Aviation (DGCA) and supports the DGCA in the assessment of event-related risks and the implementation of a Civil Aviation response.

To mitigate the spread of pandemic and communicable disease events by air travel, TC CACO developed plans, memoranda of understanding (MOU) and procedures in accordance with the *Emergency Management Act* (EMA), the *Quarantine Act* and associated regulatory requirements. The EMA requires that all Ministers accountable to the Parliament of Canada plan for, prepare for and respond to emergencies related to their area of responsibility. In accordance with the *Quarantine Act* (2005), the Minister of Health is responsible for establishing quarantine stations and designating quarantine officers and environmental health officers. The *Quarantine Act* is intended to prevent the introduction and spread of communicable diseases arriving into or departing from Canada. It applies to travellers, conveyances, goods and cargo. Under the *Quarantine Act* and the *Canadian Pandemic Influenza Plan for the Health Sector*, the Public Health Agency of Canada (PHAC) is responsible for the promotion and protection of Canadians' health. To assist the PHAC in its mandate, a MOU between TC Civil Aviation, the PHAC and Health Canada (HC) was established to facilitate coordination and exchange of operational information during a pandemic or communicable disease event.

Measures

CACO's personnel have delegated authority, in accordance with the *Aeronautics Act*, to maintain a safe, secure, efficient and environmentally responsible air transportation system. If required, CACO can divert an aircraft, restrict airspace, facilitate the exchange of information among stakeholders, and make recommendations to airlines regarding the cancellation of flights to and from international destinations with known contagious disease outbreaks.

In addition, personnel from various agencies, stakeholders (i.e. Canada Border Services Agency, Canadian Air Transport Security Agency and PHAC quarantine stations) and airlines are trained to identify individuals who appear sick and are able to refer them for secondary screening. In serious instances where an illness is detected in flight, an aircraft may be isolated upon landing, away from the terminal, until quarantine officers are brought aboard to assess the individual(s).

Examples

During the H1N1 pandemic in 2009, CACO was involved in interdepartmental working groups with PHAC, HC and international partners such as Mexico and the United States. In cooperation with these partners, the *Civil Aviation Contingency Plan for Pandemics and Communicable Disease Events* was developed and the *Communicable Disease and Public Health Risk Air Traffic Operational Response Concept of Operations (Trilateral CONOPS)* was updated. Thus, we endeavour to promote the planning and execution of air traffic-related response efforts in a well-coordinated, mutually supportive, timely and effective manner both domestically and internationally.

In addition, CACO helped disseminate information, such as the Health Alert Notice to airlines during H1N1:

HEALTH ALERT NOTICE
HUMAN SWINE INFLUENZA

Public Health Agency of Canada Message for International Travellers Returning to Canada from Mexico

DURING YOUR TIME OUTSIDE CANADA, YOU MAY HAVE TRAVELLED THROUGH A HUMAN SWINE INFLUENZA-AFFECTED AREA.

What is Human Swine Influenza?

- Swine influenza (sometimes called swine flu) is an influenza virus that usually affects pigs, but which may also make people sick.
- Human swine influenza is a respiratory illness that causes symptoms similar to those of the seasonal flu (fever, fatigue, lack of appetite, coughing and sore throat).

Not all travellers with influenza symptoms will have human swine influenza, however it is important to ensure that if you do experience these symptoms you follow the recommendations described below.

If you have **a fever and a cough**:

- Notify one of the airline crew immediately if you are on the plane, and
- Notify a Canadian Border Service officer when you go through Customs.

If you develop **a fever and a cough** over the next 7 days:

- Seek medical attention immediately.
- Inform a health care provider of your symptoms and your recent travel history.
- If you are sick, ***STAY HOME*** and avoid direct contact with others if possible, unless directed to seek medical care.

Protect yourself and others

- Wash your hands often – for at least 15 seconds – in warm soapy water or use alcohol based hand gel.
- If you cough or sneeze, cover your mouth and your nose with your arm.
- Keep common surfaces and items clean and disinfected.

KNOWLEDGE IS YOUR BEST DEFENCE

For more up-to-date "Health Alerts" and for more information visit

www.fightflu.ca or call **1-800-454-8302**

Public Health Agency of Canada / Agence de la santé publique du Canada

Canada

By sharing information on communicable disease outbreaks internationally, based on World Health Organization (WHO) pandemic alert phase levels, individual countries are able to prepare for and mitigate associated risks.

The WHO has established phases modelled on the identification and spread of diseases, such as influenza, explained by the PHAC table shown on the next page.

In Canada, possible scenarios that would require a plan's implementation are:

- TC is alerted to a Phase 4 condition found in a region of Canada or a Phase 5 abroad.
- TC is alerted to a Phase 6.0 pandemic or communicable disease event in a foreign country serviced by a Canadian air carrier that, for its own reasons, has ceased to service that destination. Canadians are unable to return home.
- TC is alerted to a Phase 6.2 pandemic or communicable disease event in Canada with widespread activity.

CACO continues to closely monitor the NCATS and, with the aid of stakeholders and international trading partners, aims to keep Canadian skies pandemic free. △

WHO PANDEMIC PHASES		
Inter Pandemic	**Phase 1:**	No new virus subtypes in humans. Animals in Canada or abroad may be infected with a new subtype that is considered low risk for humans.
	Phase 2:	No new virus subtypes in humans. Animals in Canada or abroad infected with a new subtype that has a substantial risk for humans.
Pandemic Alert Period	**Phase 3:**	Human infection(s) with a new virus subtype occurring in Canada or abroad. No or rare instances of human-to-human transmission.
	Phase 4:	Clusters with limited human-to-human transmission; spread is localized.
	Phase 5:	Large cluster(s) with human-to-human transmission still localized, suggesting that the virus may be becoming better adapted to humans but may not yet be fully transmissible (substantial pandemic risk).
Pandemic Period	**Phase 6.0:**	Increased and sustained transmission in the general population abroad. No cases identified in Canada.
	Phase 6.1:	Pandemic virus detected in Canada (single cases occurring).
	Phase 6.2:	Localized or widespread activity occurring in Canada.

Important Enhancements to CAP and RCAP

by Chuck Montgomery, Director, Aeronautical Information Services (AIS), Flight Operations and CNS Operations, NAV CANADA

NAV CANADA will be modernizing the format of the *Canada Air Pilot* (CAP) and *Restricted Canada Air Pilot* (RCAP) publications, starting with the first publication cycle in 2014.

Several improvements will be made, including the introduction of constant descent angle depictions, restructured communication blocks and other human factors related changes.

The types of charts affected by these changes include:

- Instrument Approach Procedures;
- Helicopter Procedures;
- Arrival (STAR); and
- Departure (SID).

Constant descent angle depictions

A key change, the depiction of constant descent angles on non-precision approach charts, will make it easier for pilots to understand and fly a constant flight path on final approach to the runway. This contributes to pilot situational awareness and helps reduce workload when completing stabilized descents.

Constant descent angle depictions reduce the probability of infringement on required obstacle clearance during the final approach segment, reduce noise levels and improve fuel efficiency by minimizing the level flight time at higher power or thrust settings.

The Transportation Safety Board of Canada (TSB), as a result of investigations into certain controlled flight into terrain accidents, has noted that during step-down approaches, aircraft are flown at minimum altitudes for a longer time, exposing people to increased risks of approach and landing accidents. The TSB has identified the benefits of depicting constant descent angles rather than the line joining the obstacle clearance altitudes.

Understanding what is changing

NAV CANADA, in partnership with the Canadian Council for Aviation and Aerospace, developed orientation information to help customers understand upcoming changes. The training package has been delivered in workshops throughout Canada over the past year.

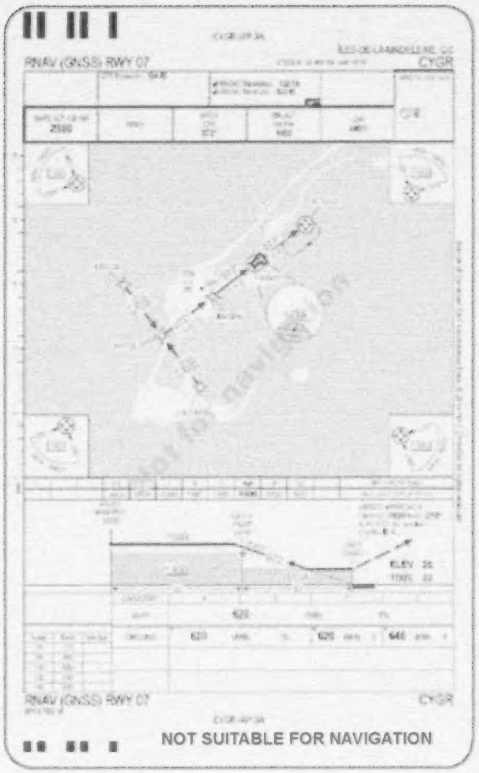
If you are interested in reviewing presentation material explaining the changes in detail, this information can be accessed on the NAV CANADA Web site here.

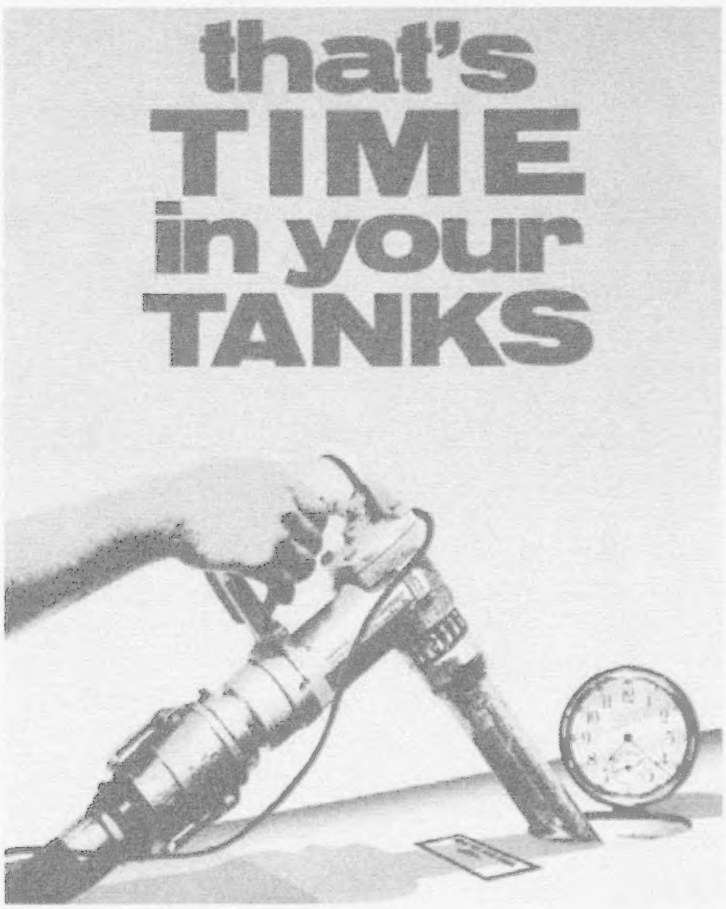
Implementation of changes

Given the need to convert a large volume of charts to the new format, implementation of the changes referenced will occur over multiple publication cycles as follows.

06-FEB-14	CAP Volumes 1 and 2
03-APR-14	CAP Volumes 3 and 7
29-MAY-14	CAP Volumes 5 and 6
24-JUL-14	CAP Volume 4 and RCAP

Further information on the implementation of these changes and the associated timelines can be found in AIC 33/13. △





Flight Operations

Night IFR Approach in IMC Claims IFR-Rated Private Pilot and Passenger 9
Sustained Stall 13

Night IFR Approach in IMC Claims IFR-Rated Private Pilot and Passenger

The following article is based on TSB Final Report A11O0239—Loss of Control—Collision with Terrain. This accident in Ottawa, Ont., took the lives of two local pilots and received a lot of media attention. The TSB report is a very compelling read for all of us, but particularly for IFR-rated private pilots or soon-to-be IFR-rated private pilots.

Summary

On December 14, 2011, a privately owned Cessna 177A Cardinal departed Wilkes-Barre Wyoming Valley Airport (KWBW), Pa., USA, with two persons on board, on an IFR flight plan to Ottawa/Carp Airport (CYRP), Ont. Approximately 44 NM from destination, because of low visibility and ceilings at destination, the aircraft diverted to its filed alternate of Ottawa/Macdonald-Cartier International Airport (CYOW), Ont. The aircraft was then cleared for an ILS approach to Runway 07. At about 19:12 (all times quoted are EST), while flying the approach in instrument meteorological conditions (IMC) at night, the aircraft collided with the ground approximately 1.9 NM west of the threshold of Runway 07. The aircraft was destroyed, and both occupants were fatally injured. There was no fire. The 406 MHz ELT activated on impact.

Wreckage of Cessna Cardinal 1.9 NM west of the threshold of Runway 07at CYOW

History of the flight

The aircraft was returning to CYRP from a 12-day trip to southern Florida and the Bahamas. Both persons on board were licensed pilots and generally shared the flying duties throughout the trip.

On December 13, 2011, the two pilots checked out of their hotel at 07:00 and departed Marsh Harbour International Airport (MYAM), Bahamas, at 09:57 for Newport News/Williamsburg International Airport (KPHF), Va. The flight consisted of three stops and 10.5 hr of flight time, arriving at KPHF at 00:16 on December 14, 2011. The pilots checked into a hotel at 00:55.

At 12:15 on December 14, 2011, the aircraft departed KPHF and arrived in Wilkes-Barre Wyoming Valley Airport (KWBW), Pa., at 14:51. At approximately 17:07, after civil twilight, the aircraft departed KWBW on an IFR flight plan destined for CYRP. At 18:40, approximately 44 NM south of CYRP, the pilot-in-command (PIC) requested a diversion to CYOW for a Runway 07 ILS approach. CYOW is located 15 NM east of CYRP. An ILS approach is unavailable at CYRP.

At 19:06, Ottawa Terminal ATC cleared the aircraft for the ILS approach to Runway 07 and issued radar vectors to intercept the final approach course. The aircraft intercepted the localizer approximately 8 NM from the threshold, and the terminal controller instructed the aircraft to contact the Ottawa tower controller. The tower controller informed the aircraft that it was number one in the landing sequence. At approximately 4.5 NM from CYOW, while on the ILS approach, the aircraft began to deviate north of the localizer. The tower controller informed the pilot of the deviation. The pilot acknowledged the information and informed the tower controller that they were trying to get back on track. A minute later, as the aircraft was approaching the centre of the localizer, the tower controller cleared the aircraft to land. Shortly after receiving the landing clearance, the aircraft began to deviate northbound again; the controller informed the pilot of the deviation. There was a brief, unrecognizable transmission on the tower frequency, but it could not be confirmed that it came from the Cessna 177. Eighteen seconds later, the controller instructed the aircraft to pull up and go around. There was no response.

At approximately 19:12, the aircraft entered a steep right turn with a rapid descent, and struck power lines before impacting the ground 1.9 NM west of the threshold of Runway 07. Radar data show that, while on the approach, the aircraft twice deviated

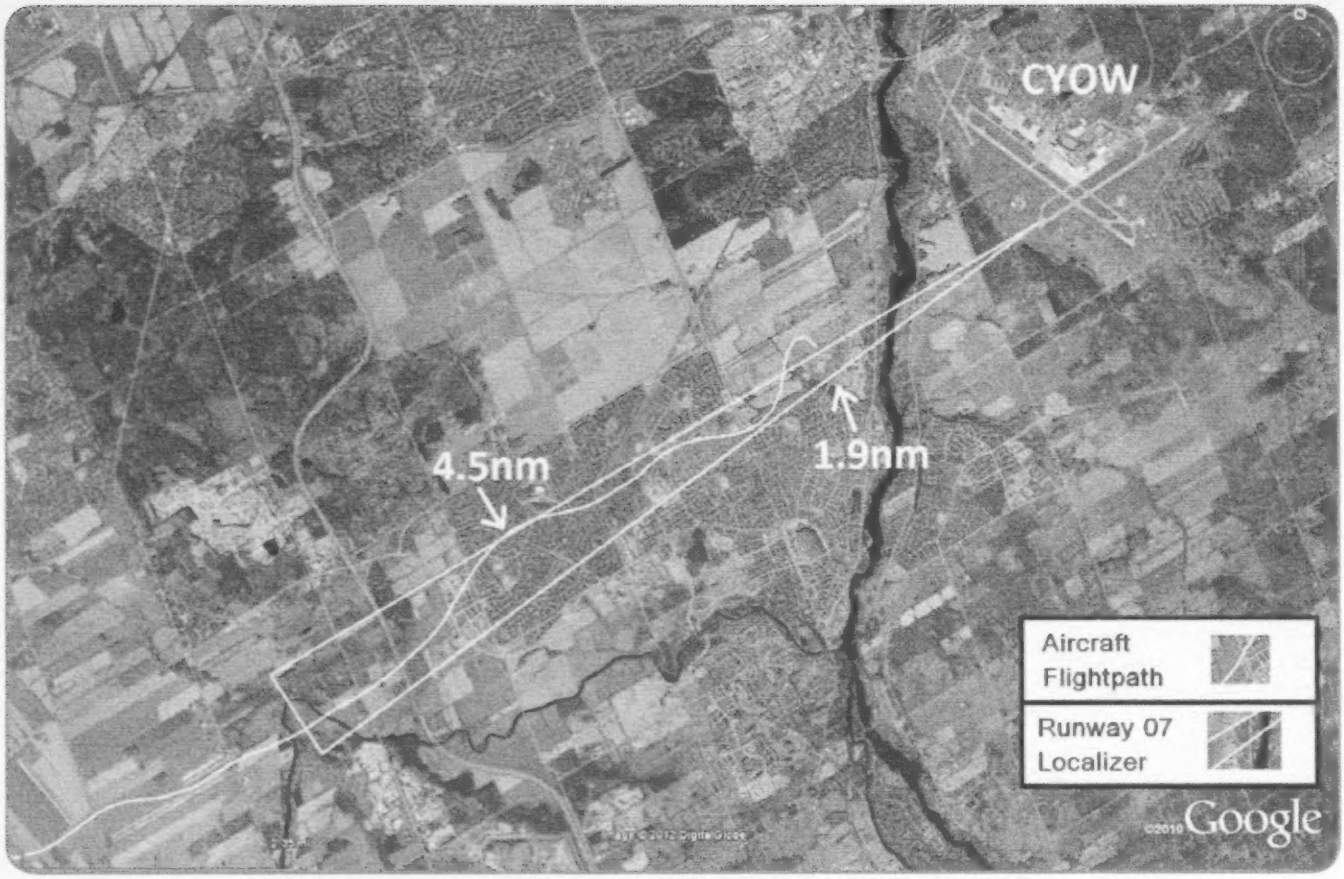


Figure 1—Aircraft's flight path showing its deviations from the localizer during the final approach.

significantly from the localizer to a point that would have caused the localizer indications on the aircraft instruments to go to full deflection. Airspeed on the approach was maintained above 100 kt until the loss of control (Figure 1).

Weather and flight planning

At 16:21, while on the ground at KWBW, the PIC filed an IFR flight plan with Williamsport flight service station (FSS). The flight was planned to depart at 17:00 and cruise at 5 000 ft, and was estimated to take 2 hr and 10 min to CYRP. The alternate airport for the flight was CYOW; the forecast weather was within alternate limits at the time of filing.

When the pilot called the FSS to file the flight plan, a weather briefing was not requested. It could not be determined if the pilot accessed the latest weather reports on the Internet prior to the flight-plan phone call. The flight service specialist asked if the pilot wanted information relating to icing and proceeded to inform the pilot of an AIRMET that forecast moderate icing between 3 000 and 14 000 ft on the flight route. The pilot asked about the area around Watertown, which was on the flight route, and the flight service specialist indicated that there were no pilot reports, but that they might encounter some showers as indicated by the AIRMET.

The latest forecast weather available for CYOW at the time that the flight plan was filed was issued at 15:38. Forecast conditions at 18:00 were visibility greater than 6 SM, scattered cloud at 1 500 ft and broken ceiling at 4 000 ft. Between 18:00 and 20:00, the conditions were forecast to deteriorate temporarily to visibility of 2 SM in mist and ceiling at 900 ft overcast. At 20:00, conditions were forecast to improve to visibility greater than 6 SM in light snow and rain showers with overcast ceilings at 3 000 ft.

The latest actual weather at CYOW at the time that the flight plan was filed was issued at 16:00. It described conditions as wind 090° at 8 kt, visibility 3 SM in mist and ceiling overcast at 700 ft.

At 18:12, while cruising at 5 000 ft, 29 NM south of Watertown International Airport (KART), the pilot requested a weather update for KART and CYOW from Boston Flight Watch (BFW). The BFW specialist reported conditions at KART to be visibility 10 SM and overcast ceilings at 9 500 ft, and conditions at CYOW to be visibility 3 SM in mist and overcast ceiling at 200 ft. The specialist repeated the AIRMET previously described, and the PIC indicated that the crew would check for updates once the aircraft was across the border.

At 18:34, while crossing the Canada–USA border near Gananoque, Ont., the pilot requested a weather update for CYOW from Montréal ATC. The weather relayed was the same as previously reported by BFW. Six minutes later, the pilot asked to change the destination to CYOW.

At 19:06, before clearing the aircraft for the ILS approach, Ottawa Terminal ATC issued the latest weather to the pilot: ceiling at 200 ft AGL, visibility 3 SM in mist and wind 100° at 10 kt gusting to 15 kt.

The aircraft

The aircraft was certified, equipped and maintained in accordance with existing regulations. Examination of the aircraft wreckage determined that there were no signs of pre-impact damage or defects that would have precluded safe flight. The aircraft was not certified for flight into known icing conditions and did not have any anti-ice equipment other than a heated pitot tube.

The aircraft collided with the ground with the flaps selected up. In this configuration, the Cessna 177A stall speed is listed in the owner's manual as 57 kt.

The pilot and passenger

The PIC held a private pilot licence, a valid Category 3 medical certificate and a valid Group 3 instrument rating. The pilot's personal logbook, last completed prior to the return trip, contained the following totals (hr):

Total flying time	429.1
Night flying as PIC	30.3
PIC on the accident aircraft	28.7
Actual instrument	44.1
Simulated instrument (hood)	40.9
Simulator	41.8

While the logbook showed a total of 44.1 hr of actual instrument time, the TSB determined that this column was being used to record time spent flying on IFR flight plans rather than time spent in actual IMC. Analysis of the departure, arrival and en route weather of these recorded flights suggests the pilot had experienced very little, if any, actual flight in IMC.

Canadian Aviation Regulation (CAR) 401.05(2)(b)(i)(B) requires a pilot who is carrying passengers at night to have completed five night takeoffs and five night landings in the preceding six months. Records indicate that the PIC had completed only one takeoff and two landings at night in the prescribed time period.

The passenger held a private pilot licence and a valid Category 3 medical certificate. Records indicate that the passenger had approximately 330 hr of experience, including 58 hr at night as PIC and 5.9 hr under simulated instrument conditions. The passenger did not possess an instrument rating.

Flight tests

Flight tests in Canada are evaluated using a 4-point marking scale. A detailed explanation of the marking scale is outlined in the *Flight Test Guide—Instrument Rating* published by Transport Canada (TC), but the following applies in general:

4 – Performance is well executed considering existing conditions.

3 – Performance is observed to include minor errors.

2 – Performance is observed to include major errors.

1 – Performance is observed to include critical errors, or the aim of the test sequence/item is not achieved.

The PIC had attempted 5 flight tests since beginning flight training in 2003.

On May 5, 2005, the PIC completed a private pilot flight test, which was assessed as a pass. On Exercise 24A: Instrument Flying—Full Panel, the PIC received a mark of 2. The pilot examiner noted that the candidate was "chasing the needle", referring to a series of over-corrections in an effort to regain the desired track.

On October 26, 2007, the PIC completed an instrument-rating flight test, which was assessed as a pass. On Exercise 8: ILS Approach, the PIC received a mark of 2. The pilot examiner noted that the candidate let the glideslope deviate to ½-scale deflection inside the outer marker, because he was trying to read the pre-landing checklist. The PIC was granted an instrument rating valid to November 1, 2009.

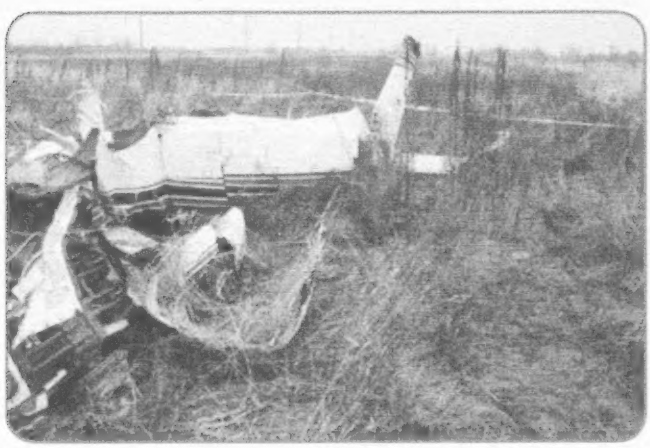
On December 11, 2009, the PIC attempted an instrument rating renewal flight test, which was assessed as a fail. On Exercise 2: IFR Operational Knowledge, the PIC received a mark of 1. The pilot examiner noted that the candidate was unable to explain the approach ban and showed an unacceptable level of knowledge. The flight test was stopped on the ground after this exercise was failed.

On October 7, 2011, the PIC attempted an instrument rating renewal flight test, which was assessed as a fail. On Exercise 8: ILS Approach and Exercise 9: Missed Approach, the PIC received a mark of 1. The pilot examiner noted that the candidate let the glideslope deviate to full-scale deflection and let the course deviation indicator deflect fully en route to the missed-approach waypoint.

TC's *Flight Test Guide—Instrument Rating* describes the aim, description and performance criteria for each exercise to be completed on the flight test. For Exercise 8 (ILS or LPV[1] Instrument Approach [Precision Approach]), the Performance Criteria section, (i), states that assessment will be based on the candidate's ability to, "on final approach course, allow no more than ½-scale deflection of the localizer or glideslope indications".

CAR Standard 421.49(4)(b) requires applicants renewing an instrument rating that expired more than 24 months before the date of application to rewrite the instrument-rating written examination (INRAT). The original instrument rating held by the PIC would have been expired for 24 months on November 1, 2011.

On October 31, 2011, the PIC completed an instrument-rating renewal flight test, which was assessed as a pass. The PIC received a mark of 2 on 4 exercises, including Arrival, Holding, RNAV Approach and ILS Approach. The pilot examiner noted on the flight test report that the candidate let the localizer deviate to ½-scale deflection upon interception. Notes written on a separate piece of paper during the flight test described the localizer deviation as ¾-scale. Had the most recent instrument-rating renewal flight test not been completed, the PIC would have had to rewrite the INRAT.



Factors affecting pilot decision making

The PIC had several work appointments that were scheduled for the day following the accident. In addition, the pilot also had personal commitments to attend to later that week.

In the *Operators Guide to Human Factors in Aviation*[2] (OGHFA), the Flight Safety Foundation (FSF) describes the phenomenon of making a decision to continue to the planned destination or toward the planned goal even when significantly less risky alternatives exist. This phenomenon has been variously referred to as "press-on-itis", "get-home-itis", "hurry syndrome", "plan continuation" and "goal fixation"[3].

The FSF states that the following are some of the reasons that aircrews may be susceptible to "press-on-itis":

- They have a personal commitment/appointment at the completion of the flight, or they may simply want to get to the destination.
- They want to "just get the job done" (excessive commitment to task accomplishment) and are influenced by organizational goals such as on-time arrival, fuel savings and passenger convenience.
- They focus solely on aircraft flight path control, due to turbulence and other distractions.
- "We are almost there, let's just do it and get it over with."
- They become task-saturated.
- They are fatigued.
- They lose situational awareness and are not fully aware of the potentially perilous situation.
- They have not set performance limits and trigger gates that require a go-around.
- They are not fully aware of their own limitations and/or the aircraft's limitations.

Analysis

The PIC was appropriately licensed and instrument rated. However, the most recent, and other, flight test reports showed signs that the PIC had continued difficulty conducting ILS approaches. In addition, the PIC was not current in night-flying operations, and had very little, if any, experience in actual IMC. Most of the PIC's instrument-flying experience was acquired during training in simulated IMC and in the simulator.

2 European Advisory Committee, *Operators Guide to Human Factors in Aviation*. Flight Safety Foundation (2009), available at http://www.skybrary.aero/index.php/Portal:OGHFA (last accessed 25 October 2013)

3 European Advisory Committee, "Press-on-itis" (OGHFA Briefing note), *Operators Guide to Human Factors in Aviation*, Flight Safety Foundation (2009), available at http://www.skybrary.aero/index.php/Press-on-itis_(OGHFA_BN) (last accessed on 25 October 2013)

1 Localizer performance with vertical guidance

This experience may not have presented the PIC with an accurate representation of the conditions and pressures faced in actual conditions.

The PIC chose to depart KWBW into forecast icing conditions despite the fact the aircraft was not certified for such operations. While en route, the pilot was informed of deteriorating conditions in the Ottawa area but chose to continue. This decision and the previous day's long flying schedule, combined with work and personal commitments, suggest the PIC may have been susceptible to the phenomenon known as "press-on-itis".

While on the ILS approach into Ottawa in unfamiliar night IMC, the pilot had significant difficulty maintaining the localizer. During the approach, the tower controller twice advised the pilot that the aircraft was deviating from the approach course. During the second attempt to regain the localizer, the pilot most likely made a steep right turn, which quickly developed into a rapid descent and loss of control.

Airframe icing could not be completely ruled out as a possible contributor to the loss of control, but the high airspeed (> 40 kt above the stall speed) that was maintained until the loss of control suggests that it was unlikely. Icing likely did not contribute to the aircraft's repeated deviation from the localizer and over-correction.

Finding as to causes and contributing factors

1. During an attempt to fly the precision approach at night in weather conditions unfamiliar to the pilot, control of the aircraft was lost and the aircraft collided with the ground.

Findings as to risk

1. If pilots possess limited currency and experience at night or in instrument flight conditions, the risk of a loss of control is increased when operating an aircraft in marginal weather conditions.
2. Non-recognition of the effects of the phenomenon known as "press-on-itis" can lead to increased risk that a decision will be made to depart or continue a flight when significantly less risky alternatives exist.

Other finding

1. The pilot did not meet the recency requirements for night flying with passengers.

This particular accident has created a lot of discussions in pilot lounges as well as on various online aviation blogs. Thought-provoking issues are addressed, challenged and debated. Such issues include the realities and challenges of IFR training, IFR qualification for commercial pilots as opposed to private pilots, giving and taking check rides, passing and failing those check rides, the need for actual IMC time, mentorship, IFR theoretical knowledge, pressure and the insidious effects of fatigue. While briefly mentioned in the report under "Factors affecting pilot decision making", one has to wonder whether fatigue could have been a contributing factor in this accident. Read again the pilots' schedules described in the report for December 13 (over 17 hours) and December 14 (close to 8 hours). Combined with very poor weather and the pressing desire to get home, the cumulative effects of fatigue may have played a role in this accident. Want to learn more from this accident and others? Hit the blogs, but check your feelings at the door. —Ed. △

Sustained Stall

by Mark Lacagnina. The following article was originally published in the August 2012 Issue of the Flight Safety Foundation's Aero Safety World magazine, and is reprinted with permission.

Blocked pitot tubes, excessive control inputs and cockpit confusion doomed Air France 447

Within four and a half minutes in the early hours of June 1, 2009, an Airbus A330-200 operating as Air France Flight 447 from Rio de Janeiro, Brazil, to Paris, departed from cruise flight at 35 000 ft and descended into the Atlantic Ocean, killing all 216 passengers and 12 crew members. Glimpses of what might have gone wrong emerged from several interim reports issued by the French Bureau d'Enquêtes et d'Analyses (BEA) during its long investigation of the accident. In July 2012, the bureau published a nearly 300-page final report providing a full picture of what likely happened during those critical moments.

According to the report, the trouble began when the A330's pitot tubes were obstructed by ice crystals, causing the various air data

sources to produce unreliable airspeed information. Reacting as designed, the electronic flight control system (EFCS) rejected the air data, disengaged the autopilot and autothrottle, and reverted to a lower control law that provides fewer protections against flight-envelope deviations. Startled by the unexpected and unfamiliar situation, and with turbulence making sidestick control inputs difficult, the pilot flying (PF) inadvertently commanded a steep nose-up pitch change while leveling the airplane's wings.

The flight crew—a copilot and a relief pilot filling in for the resting captain—recognized the loss of reliable airspeed data but did not conduct the associated checklist procedure. Confusion reigned on the flight deck, and crew coordination vanished. Without automatic angle-of-attack protection, the airplane entered a stall. The crew either believed that the stall warnings were spurious or mistook the airframe buffeting as a sign of an overspeed. No recovery action was taken, and the A330 remained in a stall as it descended to the sea.

Based on the findings of the investigation, the BEA made 41 recommendations to various organizations worldwide on topics including pilot training, equipment certification, air traffic control (ATC) and search and rescue.

Augmented Crew

Air France 447 had an augmented flight crew comprising a captain and two copilots. When the airplane departed from Rio de Janeiro at 2229 coordinated universal time (1929 local), the captain was in the left seat and serving as pilot not flying (PNF), and one of the copilots was flying from the right seat.

The captain, 58, had 10 988 flight hours, including 1 747 hours as pilot-in-command in type. The PF, 32, had 2 936 flight hours, including 807 hours in type. The other copilot was 37 and had 6 547 flight hours, with 4 479 hours in type.

About two hours after departing from Rio, the flight crew received information from the airline's operations center about an area of convective activity developing along the route between the SALPU and TASIL navigation waypoints. Shortly thereafter, the PF remarked that the airplane was "entering the cloud layer," and the light turbulence to which the flight had been exposed increased slightly.

The report said that statements captured by the cockpit voice recorder indicated that the PF became preoccupied with the conditions they might encounter as the flight progressed through the intertropical convergence zone (ITCZ). Several times, he expressed concern about the turbulence and the relatively warm outside air that limited the airplane's performance and precluded a climb to FL370 (approximately 37 000 ft), to get above the clouds. He suggested that they request clearance from ATC to climb to FL360, which is not a standard level for their direction of flight.

"Some anxiety was noticeable" in the PF's statements, the report said. "The captain appeared very unresponsive to the concerns expressed by the PF about the ITCZ. He favored waiting and responding to any turbulence noted." The report said that the captain had crossed the ITCZ many times and likely considered the present conditions as normal.

Preparing for a rest break at 0152, the captain woke the other copilot, who was in the crew rest facility, and summoned him to the cockpit. The copilot took the left seat vacated by the captain and was briefed by the PF about the flight conditions. The turbulence had subsided, but the PF said that they could expect more turbulence ahead and that they presently could not attempt to climb above the clouds. The PF also noted that they had not been able to establish a position-reporting data link with the Dakar Oceanic flight information region (FIR).

The captain did not contribute any information to the briefing before he left the cockpit at 0200 and went to the crew rest facility. He also did not specifically designate which copilot would serve as the "relief pilot"—that is, the captain's replacement—although he implied that the copilot in the right seat (the PF) would fill that role. The report said that the decision was questionable considering the significantly higher experience level of the other copilot.

At this point, the A330 was nearing the ORARO waypoint, which is between SALPU and TASIL, and entering the ITCZ. Airspeed was Mach 0.82, and the pitch attitude was 2.5° nose-up. The turbulence increased again, and the PF advised the cabin crew that the turbulence soon would intensify. "You'll have to watch out there," he said. "I'll call you when we're out of it."

At 0208, the PNF, who was examining the weather radar display, suggested that they "go to the left a bit." The selected heading then was adjusted 12° left. In addition, "the crew decided to reduce the speed to about Mach 0.80, and engine deicing was turned on," the report said.

Exiting the Envelope

At 0210:05, the autopilot and autothrottle disengaged, and the PF announced, "I have the controls." The PNF responded, "All right."

The airplane, which already had been near its performance limits in high-altitude cruise, "exited its flight envelope" within a minute of autopilot disengagement, the report said. "Neither of the two crewmembers had the clarity of thought necessary to take the corrective actions. However, every passing second required a more purposeful corrective piloting input."

The airspeed shown on the left primary flight display (PFD) decreased rapidly from about 275 kt to 60 kt. A few moments later, the airspeeds shown on the integrated standby instrument system and the right PFD also decreased.

The ice crystal icing that had blocked the A330's pitot probes is a phenomenon that is not well understood, according to the report. "In the presence of ice crystals, there is no visible accretion of ice or frost on the outside, nor on the nose of the probe, since the crystals bounce off of these surfaces. However, the ice crystals can be ingested by the probe air intake. According to the flight conditions (altitude, temperature, Mach), if the concentration of crystals is greater than the capacity for deicing of the heating element and evacuation by the purge holes, the crystals accumulate in large numbers in the probe tube." The resulting disruption of total pressure measurement produces unreliable airspeed information, causing reversion from normal to alternate flight control law.

The airplane had pitched about 2° nose-down and had begun rolling right when the autopilot disengaged. "The PF made rapid and high-amplitude roll control inputs, more or less from stop to stop," the report said. "He also made a nose-up input that increased the aeroplane's pitch attitude up to 11 degrees in 10 seconds." As a result, the airplane began to climb rapidly. The aural and visual stall warnings activated twice, briefly.

> *"However, neither pilot called for the abnormal/emergency checklist that addresses unreliable airspeed indications."*

"The excessive nature of the PF's inputs can be explained by the startle effect and the emotional shock at the autopilot disconnection," the report said. "Although the PF's initial excessive nose-up reaction may thus be fairly easily understood, the same is not true for the persistence of this input."

The PNF was not immediately aware of the PF's control inputs or that, because of the unreliable airspeed data, the EFCS control law had changed from normal, which would prevent the airplane from reaching stall angle-of-attack, to alternate, which would not prevent a stall. He reacted to the stall warnings by saying, "What was that?"

The PNF then noticed the airspeed anomalies, as well as the reversion to alternate control law. At 0210:16, he announced, "We've lost the speeds," and added, "alternate law protections." The PF also noticed the airspeed anomalies. "We haven't got a good display of speed," he said.

However, neither pilot called for the abnormal/emergency checklist that addresses unreliable airspeed indications. Among the checklist actions is disengagement of the flight directors, which can—and did in this case—present erroneous cues in the absence of consistent airspeed information.

The report said that the pilots did not focus on the problem involving the abnormal airspeed indications because they might have perceived "a much more complex overall problem than simply the loss of airspeed information."

Several messages appeared on the electronic centralized aircraft monitor (ECAM), and the PNF read them out "in a disorganized manner," the report said, also noting that none of the ECAM messages provided an "explicit indication that could allow a rapid and accurate diagnosis" of the situation.

At 0210:27, the PNF observed indications that the airplane was climbing and said, twice, "Go back down." The PF acknowledged and made several nose-down sidestick inputs that reduced the pitch attitude and the vertical speed. However, the report said that, possibly due to an erroneous flight director prompt to increase the pitch attitude, the PF did not make control inputs sufficient to halt the climb.

At 0210:36, the airspeed information shown on the left PFD returned to normal; the indication was 223 kt. "The aeroplane had lost about 50 kt since the autopilot disconnection and the beginning of the climb," the report said.

'I Don't Have Control'

The PNF was calling the captain to return to the cockpit at 0210:51, when the stall warnings activated again. Pre-stall buffeting began seconds later. "The crew never referred either to the stall warning or the buffet that they had likely felt," the report said.

The PF applied takeoff/go-around thrust but continued to apply nose-up control inputs. This is how pilots typically are trained to react to stall indications at low altitude, the report said, noting, however, that "at this point, only descent … through a nose-down input on the sidestick would have made it possible to bring the aeroplane back within the flight envelope."

The buffeting, aerodynamic noise and misleading flight director indications might have caused the PF to believe that an overspeed situation existed, the report said. He reduced thrust to idle and attempted to extend the speed brakes.

The EFCS autotrim system reacted to the PF's continued back pressure on the sidestick by moving the horizontal stabilizer to its full airplane-nose-up position, where it remained until the end of the flight. "The PF continued to make nose-up inputs,"

the report said. "The aeroplane's altitude reached its maximum of about 38,000 ft; its pitch attitude and angle-of-attack were 16 degrees."

At 0211:38, the PF told the PNF, "I don't have control of the plane at all." The PNF responded by announcing, "Controls to the left," and pressing the pushbutton on his sidestick to transfer flight control priority from the PF's sidestick to his sidestick.

"The PF almost immediately took back priority without any callout and continued piloting," the report said. "The priority takeover by the PF could not be explained but bears witness to the de-structuring of the task sharing" between the pilots.

The captain likely noticed the airframe buffeting and the airplane's high pitch attitude while returning to the cockpit at 0211:42. The continuous aural master warning and intermittent stall warning, the confusing instrument indications and the stress conveyed by the two copilots when they told him that they had lost control of the airplane likely made it difficult for the captain to grasp the situation, the report said. "Subsequently, his interventions showed that he had also not identified the stall."

The airplane was descending through 35 000 ft at 10 000 fpm with a 40° angle-of-attack and with roll oscillations reaching 40°. "Only an extremely purposeful crew with a good comprehension of the situation could have carried out a maneuver that would have made it possible to perhaps recover control of the aeroplane," the report said.

At 0212:02, the PF said, "I have no more displays," and the PNF said, "We have no valid indications."

"At that moment, the thrust levers were in the 'IDLE' detent and the engines' N1s [fan speeds] were at 55 percent," the report said. "Around 15 seconds later, the PF made pitch-down inputs. In the following moments, the angle-of-attack decreased, the speeds became valid again and the stall warning triggered again."

At 0214:17, the ground-proximity warning system began to generate "SINK RATE" and "PULL UP" warnings.

The flight data recorder ceased to function at 0214:28. "The last recorded values were a vertical speed of 10,913 fpm, a groundspeed of 107 kt, pitch attitude of 16.2 degrees nose-up, roll angle of 5.3 degrees left, and a magnetic heading of 270 degrees," the report said. "No emergency message was transmitted by the crew. The wreckage was found at a depth of 3,900 m [12,796 ft] on 2 April 2011."

This article is based on the English translation of the BEA's "Final Report on the Accident on 1st June 2009 to the Airbus A330-203, Registered F-CZCP, Operated by Air France, Flight AF 447, Rio de Janeiro–Paris." The report is available in English and the original French at www.bea.aero. △

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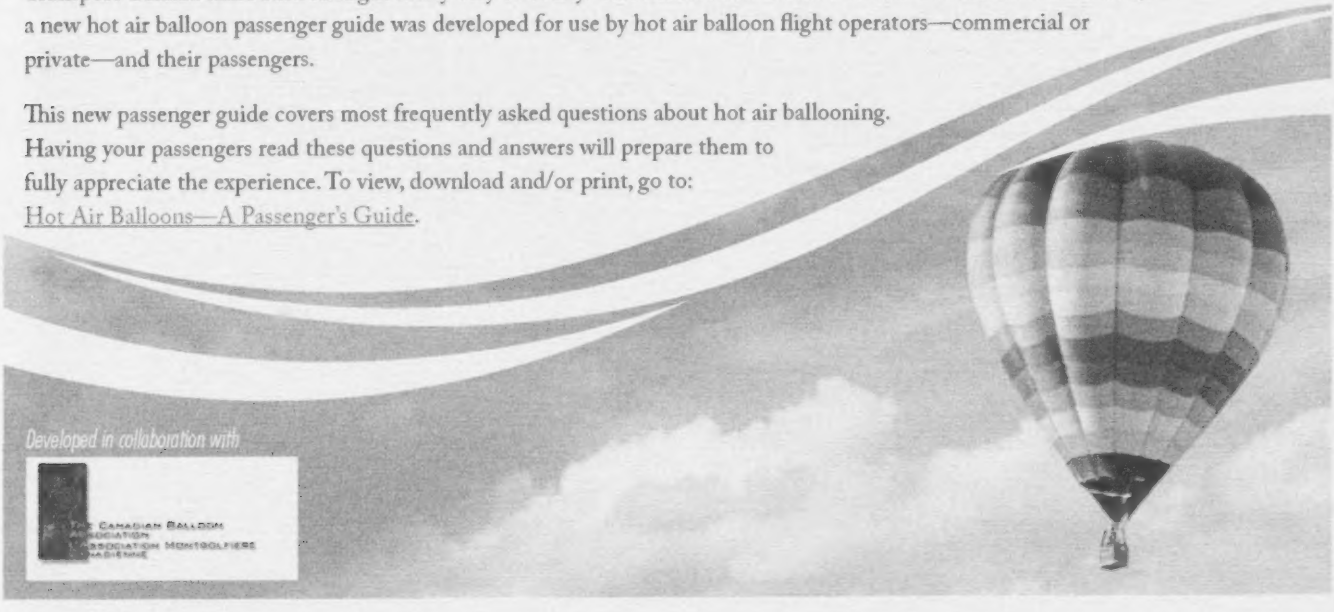
Transport Canada takes balloon flight safety very seriously. In collaboration with the Canadian Balloon Association, a new hot air balloon passenger guide was developed for use by hot air balloon flight operators—commercial or private—and their passengers.

This new passenger guide covers most frequently asked questions about hot air ballooning. Having your passengers read these questions and answers will prepare them to fully appreciate the experience. To view, download and/or print, go to: Hot Air Balloons—A Passenger's Guide.



Under Pressure

by DeborahAnn Cavalcante, Aircraft Maintenance Technology (AMT) contributor. This article was originally published in the March 2013 issue of AMT magazine and is reprinted with permission.

Fatigue for aviation maintenance technicians (AMTs)[1] comes in many different forms: physical, mental and emotional.

AMTs often work long hours under pressure, including working through the night. This often results in not just extreme fatigue but errors, some of which may potentially be life-threatening to pilots and passengers as well as to the AMTs themselves.

It is no secret that fatigue can come in different forms: physical, mental and emotional. Physical fatigue brings about muscle soreness, oxygen debt or extreme tiredness caused by sleep deprivation, illness or poor nutrition.

Many AMTs may experience the weariness of emotional fatigue resulting from performing undesirable tasks which may additionally be performed under trying conditions. High levels of focus and concentration associated with complex tasks create mental fatigue, which combined with the physical or emotional, leads to increased errors and risks in safety sensitive arenas.

There are a countless number of documented errors and accidents attributed to tiredness and fatigue in the maintenance workplace. Studies have shown that fatigue can have consequential effects on a person's cognitive ability. Cognition refers to mental processes such as awareness, perception, reasoning and judgment.

Fatigue has drawn parallels to the effects of alcohol. In 2000, Williamson, Feyer, Friswell and Finlay-Brown conducted a study on driver fatigue and found that after 17 to 19 hr without sleep, performance on some tests was equivalent or worse than that at 0.05 percent blood alcohol content. Response speeds were up to 50 percent slower for some tests and accuracy measures were significantly poorer at this level of alcohol. After longer periods without sleep, performance reached levels equivalent to the maximum alcohol dose given to participants (0.1 percent blood alcohol content).

The findings reinforced empirically that sleep deprivation is likely to compromise decision-making ability and accuracy needed for safety on the road and in other industrial settings.

Further FAA studies and self-reporting by aviation maintenance mechanics indicate the average sleep for aviation maintenance mechanics routinely to be five to six hours per night, two to three hours short of the required eight hours per night. Additional studies reveal data that sleep deprivation is a cultural norm in the aviation maintenance workplace, although mechanics as a group are not generally cognizant of the fact that they do not get enough rest.

Fatigue-related accidents

One of the most notable aviation maintenance fatigue-related accidents occurred in 1990 when British Airways Flight 5390 experienced a windscreen blowout shortly after departure from Birmingham International Airport in the United Kingdom. The left windscreen, which had been replaced prior to the flight, was blown out under the effects of the cabin pressure when it overcame the retention of the securing bolts. Eighty-four of the 90 total bolts were of smaller than specified diameter.

The captain was sucked halfway out of the window at 18 000 ft and was miraculously restrained by the cabin crew while the co-pilot flew the aircraft to a safe landing at Southampton Airport (Air Accidents Investigation Branch report, 1992).

While the official accident report cited numerous contributing factors that led up to this incident, one of the most insidious was the effect of fatigue on the aircraft mechanic who conducted the task. The work was conducted very early in the morning at a time when the human body experiences a natural low, also known as circadian effect. This, combined with lack of sleep before his shift, may have contributed significantly to the aircraft mechanic's perceptual judgmental error in selecting the wrong size bolts for the job and then justifying that decision by believing that the countersink was too big rather than the bolt was too small.

Air Midwest Flight 5481 crashed on takeoff killing 21 people. The NTSB concluded that the aircraft was tail heavy and the pilot was unable to keep the nose down because elevator travel was restricted due to improperly rigged flight control cables. The NTSB reported the maintenance work to the aircraft's elevator system was performed on the midnight shift in the early morning hours.

Compounding the fatigue issues was the lengthy commute the employees made getting to the repair facility and long shifts

1 AMTs = Aeronautical Maintenance Engineers (AMEs) in Canada.

that were routinely worked. Work had been performed on the elevator system and interviews with the mechanics indicated a number of shortcomings with maintenance procedures including lack of proper training, insufficient resources and the possibility that fatigue affected the quality of the work performed.

Education and training alone are most likely not enough to deter mechanics from working while fatigued when many organizations push their mechanics to work 14- to 16-hour days. A combination of pressures, including customer satisfaction, management pressure, time pressures along with interruption of revenue associated with the loss of use of an aircraft, seem to win out and override good common sense as well as documented safety policy and procedures.

Effective countermeasures

This begs the question and you may well be asking, what are effective countermeasures to not only cope with the problem, but reduce maintenance errors and enhance safety? Amazingly, they are simple but require commitment to a healthy lifestyle. Eating a balanced diet stabilizes energy levels and eliminates sugar "highs and crashes." Don't go to bed too hungry or too full, as this is definitely a sleep interruption and prevents deep solid rest. Use caffeine to increase alertness when you need it, but avoid it before bed, as its wakening effects can be long-lasting.

Exercise regularly, but not before bedtime as it increases energy levels. The "at-home" environment is a factor in allocating adequate undisturbed hours for sleep. This may take some coordination with family members and their respective schedules. Enhance your sleep environment with dark curtains, a quiet room; turn off the phone and set the room temperature to 65 to 68 F.

Although a healthy lifestyle goes a long way toward personal fatigue management, it alone may not be enough. As maintenance tasks are self-paced rather than externally paced, fatigue management becomes a partnership between the employer and the employee. As an industry, a re-evaluation and recognition of the cultural norm in the aviation maintenance world that no workday is too long, and a lack of required rest periods is detrimental to safety is well in order. Workplace factors include working hours, staffing levels and the availability of break periods.

Risk management

Effective fatigue risk management requires a partnership between the employer and the employee, as each can contribute uniquely to solutions (Dawson, 2000; Fletcher, 2007; Transport Canada, 2007b, 2007c). It is unrealistic to aim for "zero fatigue" in all cases. An appropriate objective for fatigue risk management is to ensure that risks are as low as reasonably practical (Stewart & Holmes, 2008).

The maintenance environment presents opportunities to modify methods of task performance—having secondary inspections or operational and functional checks, and rescheduling the most safety-critical tasks, or those most susceptible to fatigue, at times when fatigue will have the least impact.

We would be foolish to think we can avoid the reduced mental functioning brought about by fatigue. For this reason, bringing awareness and focus to the problem becomes critical in mitigating it. Commitment from all levels in the organization is essential.

Ultimately, the quality of work rests with theindividual maintenance technician, who, by understanding the consequences of fatigue, is in the ultimate position to assure they are both well rested and have access to strategies to deal with maintenance fatigue.

DeborahAnn Cavalcante earned her Master of Aeronautical Science, with a specialization in Safety Management from Embry-Riddle Aeronautical University in Daytona, Fla., and her Bachelor of Science from Virginia Tech in Business and Risk Management. △

FEELING TIRED? Time to revisit Transport Canada's Fatigue Risk Management System for Canadian Aviation – FRMS Toolbox

Transport Canada commissioned a set of tools and guidelines to help the Canadian aviation industry set up fatigue risk management systems. Fatigue risk management systems are based on the premise that it's everyone's responsibility to manage fatigue. Employers should make sure that work schedules give employees adequate opportunities for rest between shifts. In turn, employees are responsible for making sure they use those opportunities to get the sleep they need to be fit for work. Use the FRMS Toolbox today!

TSB Final Report Summaries

The following summaries are extracted from final reports issued by the Transportation Safety Board of Canada (TSB). They have been de-identified and include the TSB's synopsis and selected findings. Some excerpts from the analysis section may be included, where needed, to better understand the findings. Unless otherwise specified, all photos and illustrations were provided by the TSB. For the benefit of our readers, all the occurrence titles are hyperlinked to the full TSB report on the TSB Web site. —Ed.

TSB Final Report A10Q0213—Runway Excursion

On November 30, 2010, a U.S.-registered Boeing 737-823 departed Dallas/Fort Worth International Airport, U.S.A., on a scheduled flight to Montréal/Pierre Elliott Trudeau International Airport, Que. At 19:53 EST, after touching down on Runway 24R in light rain during the hours of darkness, the aircraft gradually veered left of the centreline. It departed the runway surface and stopped in the grass and mud, approximately 90 ft from the runway edge and 6 600 ft from the threshold. None of the 106 passengers, 6 crew members or 1 off-duty crew member were injured. Evacuation was not deemed necessary; all passengers and cabin crew deplaned via an air stair and were transported by bus to the terminal. Damage to the aircraft was minor. *The TSB authorized the release of this report on September 19, 2013.*

Boeing 737 off the runway

Findings as to causes and contributing factors

1. Following a stabilized approach and normal landing, the aircraft deviated left of the runway centreline, likely as the result of a nose gear steering metering, low-slew rate jam.
2. The delayed response to the uncommanded steering event by the pilot flying was not sufficient to counteract the movement toward the left, and the aircraft departed the runway surface.

Findings as to risk

1. In the absence of information on uncommanded steering events due to nose gear steering rate jams, there is a risk that the cause of these events will continue to be unresolved and unmitigated, leading to a risk of runway excursions.
2. The lack of flight data recorder information or other types of recording devices on the nose gear steering system may hinder the identification of safety deficiencies.

Other finding

1. The flight operational quality assurance[1] programs in place at many airlines already target certain events with a view to underlining safety concerns. With additional filters, it would be possible to flag steering events in order to help in verifying for rate-jam events.

Safety action taken

Operator

In April 2011, as part of its pilots' recurrent training human factors class, the operator introduced a simulation and discussion of this Boeing 737 runway excursion. This training is given to company pilots to educate them on the possibility of a runway excursion due to a nose wheel steering problem on landing roll-out after a normal approach and landing.

Safety concern

Despite efforts in analyzing past nose gear steering, low-slew rate-jam events and carrying out post-event valve examinations, the cause of these uncommanded steering events remains uncertain. The safety review process completed by the manufacturer and based on a quantitative, cycle-based occurrence rate of 1 x 10-7, classified this event as an extremely remote probability and gave it an acceptable risk level, combined with a major severity level. An occurrence rate of 1 x 10-7 meets the *Federal Aviation Regulations* (FARs) certification requirements. Additionally, an acceptable level of risk does not require further tracking of the hazard in the Federal Aviation Administration (FAA) Hazard Tracking System. Consequently, other than flight data analysis and valve examination, the manufacturer has not taken further action following the 11 known nose gear steering, rate-jam events that have occurred over the past 21 years.

1 Flight operational quality assurance (FOQA) is the term used in the U.S.A; flight data monitoring (FDM) is the term used in Canada.

Rate of occurrence determines whether a manufacturer needs to take safety action. In order to determine the rate of occurrence, there is a need to capture as many events as possible. This capture allows identification of possible safety deficiencies and aids in the application of risk-mitigation strategies. Since no defences have been put in place to mitigate the risk of a runway excursion following a rate jam, damage to aircraft and injury to aircraft occupants remains a possibility.

The present low rate of known nose gear steering rate jams may be explained by the fact that, directional control difficulties on takeoff or landing would not often result in an excursion, damage or injury, and therefore would not be reported. The lack of reporting may also be due, in part, to the fact that operators, flight crew and maintenance personnel have not been made aware of the possibility of rate-jam events, nor have they been provided information on how to recognize, react or troubleshoot these events. The rate of occurrence would have to show a significant increase to validate corrective action, as safety action is based on FARs certification and on in-service fleet following requirements.

Despite technological advancements in recording devices, many Boeing aircraft do not record nose wheel steering system parameters. Boeing models affected include 707/720, 727, 737, 747 (some models), 757, 767 and 777.

The cause of these low-slew nose gear steering rate jams over the past 21 years remains uncertain. A lack of recognition and reporting prevents adequate data collection, analysis and implementation of risk-mitigation strategies if necessary.

The Board is concerned that, in the absence of information as to the cause of uncommanded steering events due to nose gear steering rate jams, there remains a risk for runway excursions to occur.

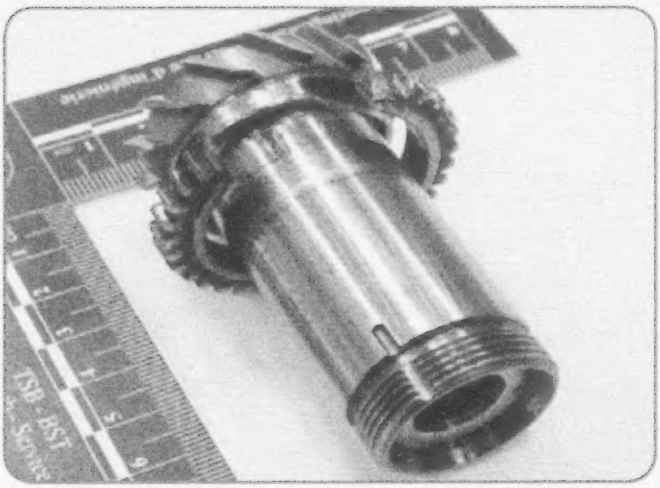
TSB Final Report A11C0047—Double Engine Power Loss and Forced Landing

On April 1, 2011, at 15:03 CST, a Construcciones Aeronauticas SA (CASA) C-212-CC40 departed from Saskatoon/Diefenbaker International Airport (CYXE), Sask., under VFR for a geophysical survey flight to the east of Saskatoon. On board were 2 pilots and a survey equipment operator. During the flight, an internal component in the right engine of the CASA C-212 failed, causing the engine to lose power. The crew of three then completed the engine failure checklist, stowed the survey equipment and turned toward Saskatoon airport. Fourteen minutes later, with the aircraft just short of the airport, the left engine lost power. The aircraft impacted a concrete noise abatement wall as the crew executed a forced landing adjacent to a road. The survey equipment operator was fatally injured, the first officer was seriously injured and the captain suffered minor injuries. The aircraft was destroyed. *The TSB authorized the release of this report on December 12, 2012.*

Right engine power loss

The torque sensor had accumulated approximately 6 470 hr since overhaul in 1997. The torque sensor assembly does not have a designated overhaul period and is normally overhauled with the engine. The laboratory analysis indicated that the case hardening of the gear tooth flanks and roots of two spur gears in the torque sensor gear train was below the manufacturer's specification requirements and likely led to the wear of the loaded faces and flanks of the gear teeth. The combined wear of the two gears likely caused an abnormal vibration that produced excessive cyclic loading and eventual fatigue cracking in the tooth roots of the intermediate gear. The intermediate

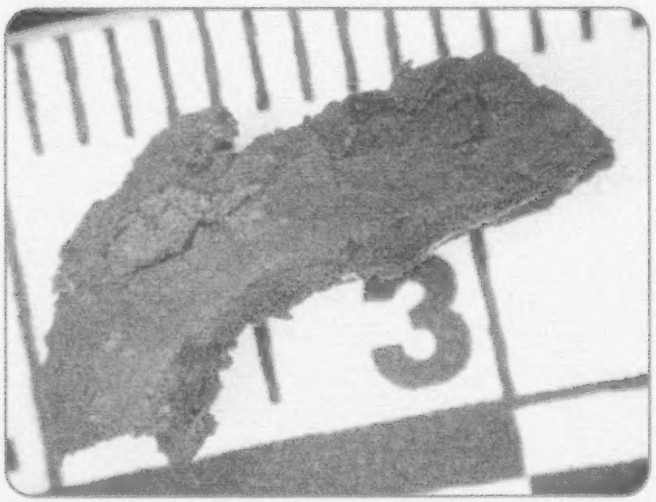
spur gear subsequently separated into several fragments and caused the loss of power transmission to the high-pressure, engine-driven fuel pump. The immediate result would have been fuel starvation of the engine, flameout and loss of power.



Failed gear on the torque sensor shaft

Left engine power loss

The left engine lost power due to fuel starvation. Investigators found debris in a fuel pump nozzle, which reduced the amount of fuel the pump delivered to the left collector tank. Fuel depletion in the left collector tank caused the engine to shut down while usable fuel remained in the left inboard tank. Additionally, the fuel cross-feed valve remained closed, which meant that the left engine was only receiving fuel from the left fuel tank, rather than from both tanks.



Debris found in fuel pump nozzle (ruler scale is cm)

Forced landing

When the left engine lost power, the aircraft was approximately 3.4 NM from the threshold of Runway 27. The crew immediately determined that it was not possible to extend the glide to the airport.

The crew had limited altitude and time to prepare for and execute the forced landing. Although the multiple engine failure procedure specified that the flaps should be retracted, the crew elected to leave them set at 25%. Had the flaps been retracted, they would have needed to be re-extended a short time later to prepare for the forced landing, and any improvement in glide performance resulting from flap retraction would not have been sufficient for the aircraft to reach the runway or a better landing site than the one chosen.

The site that was chosen for the forced landing offered the most likelihood of success with the least risk to persons on the ground. The crew landed the aircraft under control while avoiding a busy highway to the left and residential buildings on the right. The concrete noise abatement wall ran parallel to the roadway and would initially have been difficult to see from the air. The crew received immediate assistance from bystanders and were aided by a quick response from Saskatoon emergency services personnel.

Findings as to causes and contributing factors

1. The right engine lost power when the intermediate spur gear on the torque sensor shaft failed. This resulted in loss of drive to the high-pressure engine-driven pump, fuel starvation and immediate engine stoppage.
2. The ability of the left-hand no. 2 ejector pump to deliver fuel to the collector tank was compromised by foreign object debris (FOD) in the ejector pump nozzle.
3. When the fuel level in the left collector tank decreased, the left fuel level warning light likely illuminated but was not noticed by the crew.
4. The pilots did not execute the fuel level warning checklist because they did not perceive the illumination of the FUEL LEVEL LEFT TANK warning light. Consequently, the fuel cross-feed valve remained closed and only fuel from the left wing was being supplied to the left engine.
5. The left engine flamed out as a result of depletion of the collector tank and fuel starvation, and the crew had to make a forced landing resulting in an impact with a concrete noise abatement wall.

Findings as to risk

1. Depending on the combination of fuel level and bank angle in single-engine uncoordinated flight, the ejector pump system may not have the delivery capacity, when the no. 1 ejector inlet is exposed, to prevent eventual depletion of the collector tank when the engine is operated at full power. Depletion of the collector tank will result in engine power loss.
2. The master caution annunciator does not flash; this leads to a risk that the crew may not notice the illumination of

an annunciator panel segment, in turn increasing the risk of them not taking action to correct the condition which activated the master caution.

3. When cockpit voice and flight data recordings are not available to an investigation, this may preclude the identification and communication of safety deficiencies to advance transportation safety.
4. Because the inlets of the ejector pumps are unscreened, there is a risk that FOD in the fuel tank may become lodged in an ejector nozzle and result in a decrease in the fuel delivery rate to the collector tank.

Other findings

1. The crew's decision not to recover or jettison the birds[2] immediately resulted in operation for an extended period with minimal climb performance.
2. The composition and origin of the FOD, as well as how or when it had been introduced into the fuel tank, could not be determined.
3. The SkyTrac system provided timely position information that would have assisted search and rescue personnel if position data had been required.
4. Saskatoon police, firefighters and paramedics responded rapidly to the accident and provided effective assistance to the survivors.

Safety action taken

Operator

The operator grounded its remaining CASA C-212 aircraft immediately following the occurrence. Before recommencing operations on June 30, 2011, the company:

- revised its CASA C-212 one engine inoperative emergency procedures to include supplying the operating engine with fuel from both the left and right tanks by opening the cross-feed valve; and
- modified the aircraft with a remote-controlled cable cutter on the bird tow cables. This cutter permits the pilots to jettison the birds from the cockpit, eliminating the requirement for the survey equipment operator to leave his seat, and allows the pilots to quickly improve the climb performance of the aircraft in the event of a loss of engine power.

In October 2011, the aircraft was modified with the installation of a continuous ignition system for the engines.

The operator has also increased the frequency and expanded the scope of some maintenance inspections of the CASA C-212 fuel system, including cleaning of the ejector pump nozzles.

Transport Canada

On April 14, 2011, Transport Canada conducted an inspection of the company's operational control and maintenance release processes exercised for the occurrence flight. The inspection determined that all processes reviewed met applicable regulatory requirements and were being followed as described in approved company manuals.

Honeywell Aerospace

Honeywell Aerospace has initiated a revision to the component maintenance manual for the torque sensor.

Airbus Military

Airbus Military has initiated a revision to the CASA C-212 Airplane Flight Manual procedure for engine failure in flight.

TSB Final Report A11P0106—Aerodynamic Stall and Collision with Terrain

On July 5, 2011, at 15:00 PDT, a Cessna 152 with a flight instructor and a student pilot on board departed Boundary Bay, B.C., for a mountain training flight. At approximately 16:30, the aircraft collided with terrain at an elevation of 2 750 ft ASL, about 10 NM west of Harrison Lake, in daylight conditions. The ELT activated and was detected by the SARSAT system at 16:36. The Rescue Coordination Centre in Victoria, B.C., was alerted, and a search was commenced. The aircraft was destroyed by impact forces, and the occupants of the aircraft were fatally injured. There was no fire. *The TSB authorized the release of this report on July 17, 2013.*

Wreckage of Cessna 152

2 In this context, the "birds" are geophysical sensors which can be deployed and towed behind and below the aircraft by a wire. When deployed, the birds create additional drag which reduces climb rate. There is no information available for one engine inoperative climb performance with either one or both birds deployed.

Analysis

The two occupants of the aircraft were fatally injured in the accident. There were no witnesses to the final moments of the flight, and there were no on-board recording devices to assist investigators. There was no indication that an aircraft system malfunction or the weather contributed to this occurrence. The aircraft impacted the ground in a steep, nose-down attitude, suggesting a stall and in-flight loss of control.

Wreckage and site analysis

The steep, nose-down attitude and low forward speed are consistent with a situation of loss of control in flight. Both these conditions are consistent with the aircraft having conducted a steep right turn and stalling from a height less than 200 ft above the ground. Had the aircraft stalled at a higher altitude, the dynamics of the crash and the wreckage pattern would have been different. It is not likely that the aircraft had yet entered a spin, as the engine was found to be at a high power setting (the first step in the spin recovery procedure is to immediately reduce engine power), and there was still forward movement when the aircraft struck the ground.

Mountain flying training

Mountain flying presents many complex and challenging situations. There is no requirement for pilots in Canada to undergo mountain flying training before flying in mountainous areas. As a result, pilots may receive no training or be left to study the available material by themselves. There is valuable information to be shared; however, without in-depth classroom instruction, a pilot might not gain adequate knowledge of the significant hazards of mountain flying and the recommended practices for avoiding them. In addition, advances in simulation make it possible for pilots to experience some of the challenges of mountain flying and gain the associated skills. Without proper training in mountain flying techniques, pilots and passengers are exposed to increased risk of collision with terrain when conducting mountain flying.

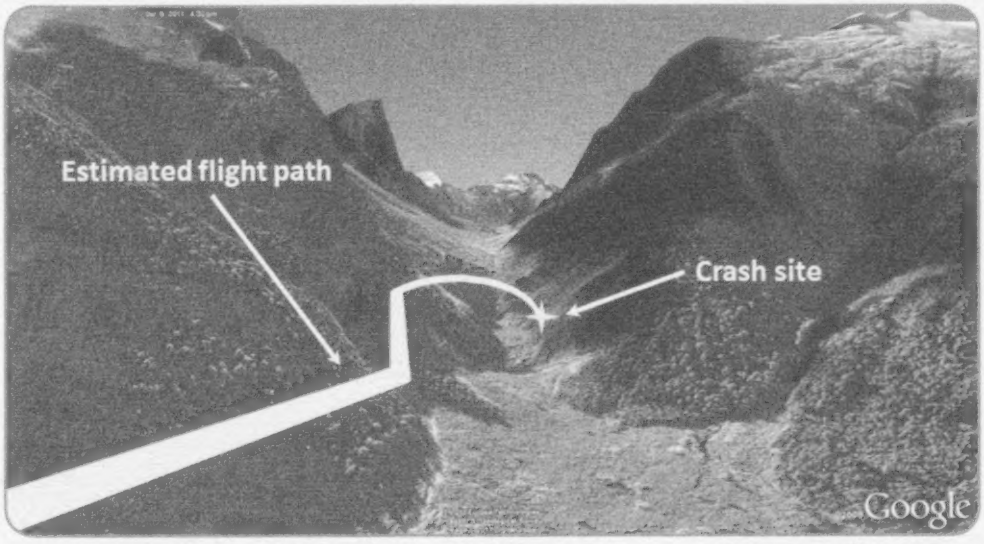
Canyon/tight turns

There is no one specific ideal canyon/tight turn that can be used on all aircraft types. Instead, a turn procedure should be developed for use with each type to ensure safety and minimize turn radius. It is important that emergency procedures, such as the canyon turn, be researched and tested on a particular aircraft type before being introduced into flight operations.

Possible accident conditions and actions

The accident occurred close to a route commonly used by the instructor for mountain flying training. It could not be determined why the aircraft entered this canyon; but, with insufficient performance to climb above the terrain at the highest point of the pass, it is likely that the pilots executed a turn in the canyon. Since the left-hand (east) side of the pass would have been exposed to the sun, it is more likely that they were flying on the left-hand side of the valley and attempted a right-hand turn. This attempt would have resulted in a turn toward a shadowed, steeply sloping surface. The lack of references associated with flying in the valley would have made it difficult for the pilots to visually determine their angle of bank relative to the horizon.

It is not known why the aircraft was at such a low level before the crash. However, conducting a turn at a low altitude would have increased the risk level of the manoeuvre and was not in accordance with the flying school policy regarding minimum flight altitudes. If the instructor delayed the decision to initiate the turn-around, it would have further reduced safety margins. With the flaps in the up position, the stall speed would have been 7 kt higher than if the flaps had been fully down. In addition, it is possible that once the turn was initiated, the aircraft encountered a downdraft on the shadow side of the valley, which could have caused the aircraft to sink. If the pilots were not cross-checking their instruments, it is also possible that the loss of horizon and visual illusions caused by the surrounding terrain may have caused the pilots to inadvertently stall the aircraft while conducting the turn.



Estimated flight path with shadows at the time of the accident (Image: Google Earth)

Although the throttle was found in a high power position, a reduction of power for even a few seconds during a critical manoeuvre would negatively affect aircraft performance. It is possible that the throttle was reapplied once the loss of performance was noted by the pilots. Any one of these factors, or a combination of them, could have caused the pilots to increase bank angle and increase angle of attack by pulling back on the control column, causing an aerodynamic stall. It is likely that the aircraft stalled aerodynamically while attempting a turn at an altitude from which the pilots could not recover before impact with terrain.

Finding as to causes and contributing factors

1. It is likely that the aircraft stalled aerodynamically while attempting a turn at an altitude from which the pilots could not recover before impact with terrain.

Findings as to risk

1. If weight and balance calculations are not documented, there is increased risk that aircraft will take off over the maximum approved gross weight.
2. Without proper training in mountain flying techniques, pilots and passengers are exposed to increased risk of collision with terrain due to the complex nature of mountain flying.
3. The reliance on an aircraft stall warning system that does not show progression toward an impending stall increases the risk of a pilot inadvertently entering a stall.
4. If pilots are taught to fly with the stall warning activated during slow flight, there is increased risk that the aircraft may inadvertently stall during slow flight manoeuvring.
5. If pilots are not taught how to recognize and recover from a high angle-of-bank stall, there is an increased risk of collision with terrain if one is encountered.
6. If emergency procedures are not validated before implementation, there is increased risk that safety margins will be reduced due to unexpected performance degradation.
7. If a flight school's standards and procedures are not incorporated into company manuals, flight instructors may deviate from company-approved methods of instruction.
8. Without flight tracking or some system of post-flight monitoring, there is a risk that management will not be aware of deviations from a school's standards that expose a flight to hazards.
9. If cockpit and data recordings are not available to an investigation, this unavailability may preclude the identification and communication of safety deficiencies to advance transportation safety.

Safety action taken

Flying school

Following the occurrence, the flying school implemented the following safety actions:

- suspension of mountain flying instruction pending review and analysis using safety management system (SMS) principles;
- the creation of a formal, regimented *Mountain Flying Training Syllabus* and training for all instructors that includes defined procedures for canyon turns, minimum altitudes, mandatory routing and standard operating procedures;
- modifications to the mountain flying program, including ground school before flight, prescribed new routing, and the use of flight training devices to enhance pilot awareness of hazards;
- mandatory written test on mountain flying awareness to ensure students have comprehension of the principles taught before flight;
- mountain flying review seminars open to the public and aimed at past and current students who are interested in the latest information and the revised syllabus;
- workshops held for instructors in effective leadership and risk management and focused on the identification of instructors taking control at appropriate points in different training scenarios, flight management under different training scenarios, and identification and appropriate management of student and air exercises based on experience and training;
- change to sign-out sheet to require the pilot to insert the actual takeoff weight and takeoff arm, with initialing by both the student and the instructor required;
- portable global positioning system (GPS) to be carried on all flights outside the Lower Mainland to allow for increased oversight by both senior management and instructional staff.

TSB Final Report A11Q0136—Engine Stoppage and Forced Landing on Water

On July 18, 2011, at approximately 14:48 EDT, a Cessna A185E floatplane left the La Tuque, Que., seaplane base for a 20-min sightseeing flight. The aircraft took off towards the north and climbed to an altitude of approximately 1 600 ft ASL. After approximately 12 min of flight time, the engine failed, and the propeller began spinning in the air. The pilot decided to proceed with an emergency ditching in the Bostonnais River. During the descent, the pilot attempted to restart the engine without success. The terrain surrounding the river forced the pilot to execute a sharp left turn. The aircraft stalled, nosedived and struck the surface of the water. The aircraft tumbled and came to rest inverted in the water. Local residents reacted quickly, contacting emergency services and offering assistance. Of the 5 passengers on board, the pilot and 3 passengers survived and

1 passenger died. The ELT was triggered on impact, but no transmission was received. *The TSB authorized the release of this report on April 17, 2013.*

Findings as to causes and contributing factors

1. The pilot did not measure the quantity of fuel with the dipstick before departing on the accident flight. Relying only on an estimation of the remaining fuel in the tanks, the pilot could not predict the precise moment at which the left tank would run dry.
2. The fuel quantity indicators on this type of aircraft were not reliable. As a result, the pilot could not be sure of the quantity of available fuel in the left tank during flight.
3. The engine very likely lost power due to momentary fuel starvation in the left tank.
4. Following the loss of power, the pilot did not activate the auxiliary electric fuel pump and was not able to restart the engine.
5. The pilot very likely pulled back on the yolk, contributing to an aerodynamic stall which took place at an altitude that precluded recovery.
6. The safety briefing provided by the pilot to the occupants was incomplete; the pilot did not point out the location of the safety features cards on board the aircraft and did not instruct the occupants on how to use the personal flotation device (PFD).

Findings as to risk

1. When the passenger guides available at the seaplane base are not distributed to passengers before takeoff, there is a risk that passengers may not recognize or appreciate the importance of emergency procedures in the event of an accident.
2. When safety instructions are provided during taxi with the engine running, there is a risk that noise or other distractions may prevent passengers from clearly understanding the information provided and being better prepared in case of emergency.
3. When the pilot does not provide complete safety instructions to occupants, there is a risk that passengers will not be adequately prepared in the event of an emergency.
4. When passengers egress an aircraft without their PFDs, their risk of drowning increases, particularly if they are injured.
5. If safety instructions are presented to children while they are distracted, there is a risk that they will not be able to egress the aircraft on their own.
6. When information is not presented to occupants regarding emergency egress and the use of a PFD in the event of an inverted and submerged aircraft, there is a risk that occupants will not be able to egress the aircraft.

Other findings

1. The airplane was equipped with an ELT that activated on impact. However, no signal was received because the antenna was submerged.
2. The rapid assistance provided by local residents likely increased the occupants' chances of survival.

Safety action taken

Operator

New safety measures have been incorporated into the company's operating procedures since May 2012, and the operations manual (COM) has been modified as well. The company showed its support for TSB Recommendation A11-06 by amending its COM to indicate that the wearing of PFDs is mandatory at all times for all occupants, including the pilot. The PFDs provided to pilots and passengers must be inflatable and must not inflate automatically when they come in contact with water. The manual stipulates that the pilot must always remind passengers to only inflate their PFDs once they have evacuated the aircraft.

In addition, the COM specifies that passenger safety briefings must now be given prior to engine start-up and include a demonstration of the use of PFDs in the event of accidental capsizing. What's more, the emergency procedures and passenger briefing for an emergency landing include the instruction to unlock doors prior to impact.

The company's training program now includes mandatory initial training, for all its pilots, on emergency egress procedures for floatplanes, with particular emphasis on underwater egress from capsized floatplanes. In addition, company pilots will be required to take rescue training.

In response to TSB Recommendation A11-05, Transport Canada issued a safety alert recommending aircraft design improvements facilitating egress. To allow rapid egress following a survivable collision with water, the operator has acquired a Supplemental Type Certificate (STC) needed for the purpose of adding jettisonable windows and moving the door handles on its DHC-2 Beaver aircraft, thereby demonstrating its support for TSB Recommendation A11-05.

TSB Final Report A11A0101—Stuck Elevator Control

On December 10, 2011, at 10:28 NST, a Hawker Beechcraft 1900D aircraft was conducting a scheduled passenger flight from Gander to Goose Bay, N.L., with 2 crew members and 13 passengers on board. After the crew began the takeoff roll on Runway 21, they noted that the control column was stuck in the full forward position. The takeoff was rejected, and the aircraft was taxied back to the terminal. The aircraft was not damaged, and there were no injuries. *The TSB authorized the release of this report on November 6, 2013.*

Analysis

Stuck elevator control

The occurrence aircraft had been parked outside, with its tail pointed into gusty winds; the operator's personnel did not always install the control locks. The *Airplane Flight Manual* (AFM) indicates that gust locks should be installed after flight and removed before flight. Installing the control locks protects the flight controls from abnormal forces such as gusty winds. Without the control lock installed, gusty winds can cause the elevators to move up and down rapidly. This movement would cause the control column to slam back and forth. The rapid downward movement, in combination with the down-spring and bob-weight force, would result in the control column vertical portion flexing under the strain of the combined forces. In this occurrence, the damage noted on the bob weight was more severe than what was observed when the elevators were allowed to free-fall or from pushing the control column forward. Therefore, the damage to the occurrence aircraft's bob weight resulted from the elevators being repeatedly slammed down when the aircraft was parked outside, without the control locks installed, in gusty wind conditions.

When the operator's personnel examined the aircraft after the occurrence, they had to push the stop bolt to the left to align the damage on the bob weight with the stop bolt. Once the stop bolt was released, it would have exerted a sideways force on the bob weight. This force would tend to hold the bob weight in position. With the bob weight held beyond its normal range of travel, the vertical portion of the T-shaped column would have been flexed forward. The design of the elevator position sensor system is such that it will read, and the flight data recorder (FDR) will record, movement beyond the normal range of travel. At the start of the occurrence flight, the elevator position indication was 1.1° beyond normal. This position is indicative of the control column travelling beyond its normal range of travel. The control column was stuck forward because the bob weight became jammed on the stop bolt.

No elevator control check was carried out during the daily maintenance inspection (DI) or the after-start checks, which resulted in the stuck control condition going undetected. The flight crew's first indication of the elevator controls being stuck was at about rotation speed.

Findings as to causes and contributing factors

1. The aircraft was parked outside, without the control locks installed, in gusty wind conditions, causing damage to the bob weight from the elevators being repeatedly slammed down.
2. The design of the stop-bolt bracket allowed the bob weight to travel beyond its normal operating range, resulting in the control column being stuck forward because the bob weight became jammed on the stop bolt.
3. No elevator control check was carried out during the daily maintenance inspection, nor as required by the after-start checks, which resulted in the stuck elevator control condition going undetected.

Findings as to risk

1. When manufacturers do not provide clear and concise information in their communications, operators may not fully understand and appreciate the safety issue and what can be done to mitigate the risk.
2. When crews engage in non-essential communication while a sterile cockpit environment is required, there is an increased risk of distraction that may cause them to make unintentional errors.
3. When operators do not carry out a complete pre-flight inspection in accordance with the manufacturer's instructions, there is a risk that a critical item will get missed, which could jeopardize the safety of flight.
4. When organizations don't identify the underlying unsafe condition, then it is likely that the resulting mitigation may not be effective in preventing a recurrence of the event.

5. When a manufacturer's maintenance documents include cautions/warnings pertaining to actions that may cause damage to aircraft systems and the cautions/warnings are not included in the *Airplane Flight Manual*, there is a risk that flight crews will be unaware of these concerns and inadvertently cause damage to the aircraft system.
6. When manufacturers' communications contain concerns related to both flight operations and maintenance and the communications' emphasis is maintenance-related, it is possible that operators will not recognize the need to distribute the communication to their flight operations department for consideration of the operational implications, possibly jeopardizing safety of flight.
7. When organizations do not use modern safety management practices, there is an increased risk that hazards will not be identified and mitigated.
8. When operators are not aware of the TSB's reporting requirements and therefore do not advise the TSB of a reportable accident or incident, there is a risk that potentially valuable information will be lost.
9. When flight crews do not take precautions to preserve cockpit voice recorder data and flight data recorder data following a reportable occurrence, there is a risk that potentially valuable information may be lost.

Other findings

1. When flight data recorders capture only the minimum required parameters as defined by the *Canadian Aviation Regulations*, potentially valuable information will not be recorded.
2. The bob weight from aircraft UE-345 did not meet the manufacturer's specified values for antimony content or hardness.
3. The operator's *Company Operations Manual* did not include procedures for preserving the flight data recorder / cockpit voice recorder following an accident or incident.
4. At the operator, *Safety Communiqué #321* was not forwarded to flight operations or the chief pilot, although it was addressed to both.

Safety action taken

Operator

Immediately following the occurrence, the company released an instruction to all staff requiring the use of flight control locks at any time when there is not a crew member at the controls of the aircraft. This instruction was also included as an amendment to the company standard operating procedures.

The operator's flight crew training now incorporates the control lock issue and loss of flight control as a simulated occurrence during all flight crew training.

After receipt of SB 27-4119, the company ordered the associated elevator bob-weight stop kits for its aircraft.

Federal Aviation Administration (FAA)

On December 23, 2011, the FAA issued Emergency Airworthiness Directive 2011-27-51, effective immediately upon receipt.

Hawker Beechcraft Corporation

In May 2012, Hawker Beechcraft Corporation issued *Model Communiqué #104* to announce newly developed *Airliner Maintenance Manual* inspection procedures intended to identify and correct noted damage to the stop bolt, the stop-bolt bracket, the bob weight and other supporting structures. These procedures require an alignment check of the bob weight with the stop bolt to ensure that no part of the stop bolt protruded beyond the face of the bob weight, and a visual examination of the weight for evidence of scraping along the side and for evidence of damage to the stop bolt and stop-bolt bracket.

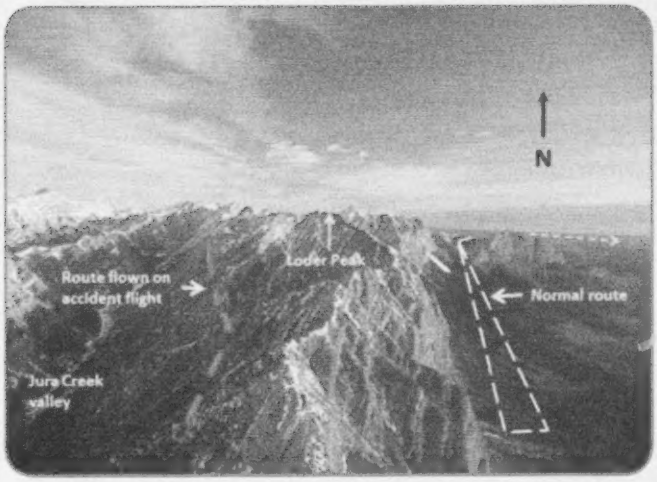
Subsequently, the third 200-hr inspection and the 5 000-hr inspection were revised and became mandatory.

In June 2013, Hawker Beechcraft Corporation issued *Mandatory Service Bulletin SB 27-4119*. This Service Bulletin introduces Kit 114-5060 (KIT - BOB WEIGHT STOP, ELEVATOR SYSTEM) for Model 1900-series airplanes and provides parts and instructions to install a second elevator bob-weight stop bolt.

TSB Final Report A12W0031—Loss of Control and Collision with Terrain

On March 30, 2012, a Bell 206B helicopter departed the Kananaskis/Nakoda base near Kananaskis, Alta., on a VFR day tour flight, with 1 pilot and 4 passengers on board. Approximately 13 min after departure, at about 10:10 MDT, the helicopter crashed in a steep, snow-covered avalanche corridor, in a cirque near Loder Peak, Alta. About 1 hr and 29 min later, the operator was advised by the Joint Rescue Coordination Centre in Trenton, Ont., that the helicopter's 406 MHz ELT was transmitting. A company helicopter was dispatched to search the tour route and found the wreckage at approximately 12:06. All occupants were extracted from the site. The 4 passengers sustained minor injuries. The pilot succumbed to injuries approximately 5 hr after the accident, following removal from the accident site. There was no post-crash fire.

The TSB authorized the release of this report on May 29, 2013.



Route of flight

Analysis

The investigation found nothing to indicate any airframe failure or system malfunction before or during the flight. The helicopter was being operated within its weight and centre-of-gravity limits at the time of the accident. As well, the weather at the time of the accident was suitable for VFR flight. Other than 2.6 hr of flight time obtained in February 2012 toward a Robinson R44 helicopter endorsement, there was no record of the pilot having flown for approximately 21 months when hired by the operator. At the time of hiring, the pilot had little or no mountain flying training or actual mountain flying experience.

Based on the pilot's self-reports of having approximately 500 hr of helicopter flight experience in B.C. and no accidents, the company considered the pilot to have adequate knowledge, skill and experience to safely conduct mountain tour flights with minimal recurrent flight training and checkout. That the pilot had a previous accident, no prior mountain flying training and minimal mountain flight experience was not identified. As a result, the pilot received very little instruction from the operator in mountain flying techniques and a minimal evaluation of abilities in that environment. The pilot's reluctance to fly in close proximity to rock outcrops during flight training heightened the company's confidence in the pilot's ability to safely conduct tour flights within the mountainous local area.

Before an earlier filming flight on which the pilot rode along, the pilot flew exclusively on the eastern side of Loder Peak over relatively gentle terrain. The pilot's change of routing to the western side on subsequent flights and operation in very close proximity to the steep, rugged terrain were likely influenced by the positive experience on the filming flight. The change was also likely motivated by a desire to provide the tour passengers with a more thrilling experience. The change in the pilot's routing was unknown to the company. Although this information was available through the Sky Connect system, the company did not have a program in place to monitor the flight profiles of inexperienced pilots. The company's flight-following procedures did not identify that the helicopter had stopped transmitting its satellite tracking position and that the pilot had not reported landing at Brokenleg Lake. This lack of information delayed initiation of search-and-rescue (SAR) operations.

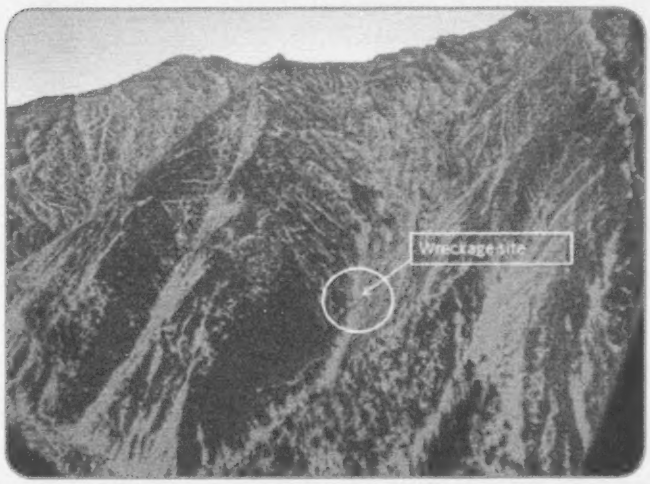
While flying below the western side of the mountain ridge and climbing toward a saddle leading to the eastern side of the ridge, the helicopter entered a shallow but very steep cirque. The company guideline stipulating that ridge crossing was to be carried out above 500 ft from any pass was not followed, increasing the risk of collision with terrain. In attempting to outclimb the terrain while presented with an illusion resulting from the lack of a true horizon and in very close proximity to the rugged rock faces, the pilot may have experienced difficulty in maintaining a constant pitch attitude. There may have been a tendency to raise the nose, when facing the mountain, with substantial loss of airspeed and climb performance. The illusion may have been compounded by a tailwind, resulting in significant movement across the ground at a low airspeed and a visual illusion of higher than actual airspeed. The turbulence that was experienced indicates that the helicopter may have entered an area of down-flowing air, or the turbulence may have been the result of a loss of translational lift, either of which would have resulted in increased power demands.

It is likely that the pilot recognized the loss of climb performance and attempted to turn left, away from the mountain and into the drop-off area. However, the decision to make this turn was likely made too late to avoid a decrease in airspeed below translational lift speed. Severe damage to the main- and tail-rotor systems indicates the application of high power when the tail rotor blades struck the rock face. Rapid, multiple rotations to the right indicate a loss of tail rotor effectiveness, which could be explained with two scenarios:

1. During an uncoordinated left turn in very close proximity to the rock face and at low airspeed, the tail rotor contacted the ground; the rotor and its drive system were destroyed.
2. The high-density altitude (7 600 ft) would have required further increase in anti-torque from the tail rotor. An unanticipated right yaw occurred when airspeed deteriorated below translational lift speed, and the pilot initiated a turn to the left. A turn with left pedal input would have placed the relative wind on the left side of the aircraft, where a combination of tail rotor vortex ring state (210° to 330° relative wind) and main rotor vortex interference (285° to 315° relative wind) would have reduced tail rotor effectiveness.

Both of these situations would have resulted in an uncontrolled rotation to the right and, unless the pilot made a substantial reduction in power, rapid rotation would have continued. In close proximity to the terrain, a significant power reduction would not have been possible without the helicopter impacting the steep mountainside at a high rate of descent. The rapid right rotation would have been accompanied by an uncontrolled descent. The helicopter was unable to hover out of ground effect, and rotation would have further reduced this capability.

The minimal mountain flying experience that the pilot received during training and during the pilot competency check (PCC) would not have provided adequate preparation for the challenging situations presented in that environment. In addition, the mentoring provided by riding along with other low-time pilots with limited experience could have instilled the wrong perceptions on proper mountain flying procedures and techniques. These perceptions could have influenced the pilot's decision-making, leading the pilot to place the aircraft in a hazardous situation while not recognizing the hazard. Extraction from the situation was delayed until safe options were not available.



Wreckage site

Findings as to causes and contributing factors

1. The pilot conducted the tour flight using a route in very close proximity to mountainous terrain, in conditions in which environmental factors resulted in reduced performance margins.
2. The visual illusion associated with the lack of a true horizon, combined with the illusion of higher-than-actual airspeed, may have resulted in pilot-initiated flight control inputs that further reduced helicopter performance.
3. The pilot attempted to cross a mountain ridge at an altitude that did not provide safe terrain clearance, and the pilot did not use the available drop-off zone early enough, which increased the risk of collision with the terrain.
4. The helicopter either sustained a tail rotor strike on terrain or, more likely, entered a condition of aerodynamic loss of tail rotor effectiveness, resulting in an uncontrolled rotation, loss of control and collision with terrain.
5. The pilot had minimal mountain flying training and experience. As a result, it is likely that the pilot was unable to recognize the hazards associated with flying in mountainous terrain.
6. The pilot was not wearing a helmet, which contributed to the level of injury.
7. The company's flight-following procedures did not identify that the aircraft had stopped transmitting its satellite tracking position, and that the pilot had not reported landing at Brokenleg Lake. This lack of information delayed initiation of SAR operations.

Findings as to risk

1. By not using lightweight flight recording systems, small aircraft commercial operators are less able to effectively monitor flight operations through an internal flight data monitoring program, which precludes proactive identification and correction of safety deficiencies by an operator to reduce accident risk.
2. If adequate surveillance is not maintained by Transport Canada, there is an increased risk that operator safety deficiencies will not be identified.
3. The ELT did not activate at impact, and signal detection was delayed due to terrain and satellite geometry. Until improvements in ELT detection times arise from inauguration of the developmental MEOSAR SARSAT system, protracted SAR times can place victims of air accidents at risk for delayed response.

Safety action taken

Operator

As a result of this accident, the operator took the following measures to reduce operational risks:

- All company pilots are now required to wear helmets while flying.
- Permission is now obtained from company pilots at time of hire to inquire into their accident history.
- The company pilot training syllabus has been enhanced to emphasize certain aspects of mountain flight training.
- Internal company indoctrination training forms have been improved.
- A quality assurance program has been put in place to validate that all company pilot training has been completed.

TSB Final Report A12P0136—Collision with Terrain

On August 13, 2012, a privately operated Piper PA-30 Twin Comanche departed Penticton Airport (CYYF), B.C., at 14:32 PDT on a VFR flight plan during daylight hours, to Boundary Bay (CZBB), B.C., with 1 pilot and 3 passengers on board. The aircraft flew northbound over Okanagan Lake for approximately 20 NM, before turning west into a valley; this was about 14 NM further than planned, due to a lower than expected rate of climb. At 14:54, an overflying airliner received an ELT signal, which the airliner pilot relayed to the area control centre (ACC). The ACC relayed it to the Joint Rescue Coordination Centre (JRCC). The aircraft wreckage was located about 2½ hr later, in a wooded area near the Brenda Mines site, approximately 18 NM west of Kelowna, B.C. There was no fire. All 4 occupants were critically injured; one occupant died at the site, and a second died in hospital two days later. The TSB investigation found that a number of factors contributed to the accident including a reduced rate of climb. The reduced rate of climb was attributed to atmospheric conditions, the aircraft being over its gross takeoff weight, reduced power in the right engine and the decision not to use available turbochargers. *The TSB authorized the release of this report on September 19, 2013.*

Analysis

Aircraft performance

The increased density altitude, from 3 300 ft at takeoff to over 7 000 ft at the accident site, resulted in reduced engine power and aerodynamic performance. In particular, the pilot's decision not to use turbocharger boost resulted in the engines performing like normally aspirated engines, with continuously decreasing engine performance as the aircraft climbed.

The pilot did not calculate weight and balance for the accident flight or the previous leg. This was, in part, likely because the information necessary to do so was not readily available to the pilot, in the journey log or elsewhere in the aircraft. On the leg before the accident flight, the aircraft departed Boundary Bay with full fuel (about 6 hr in duration), which was substantially more than was necessary to conduct the intended 2 flight legs (about 2.6 hr in total duration). On the accident leg, once the additional passengers and their baggage came on board in Penticton, the aircraft was about 150 lb over its maximum gross weight. There were no steps taken to reduce aircraft weight, and this higher weight contributed to reduced climb performance.

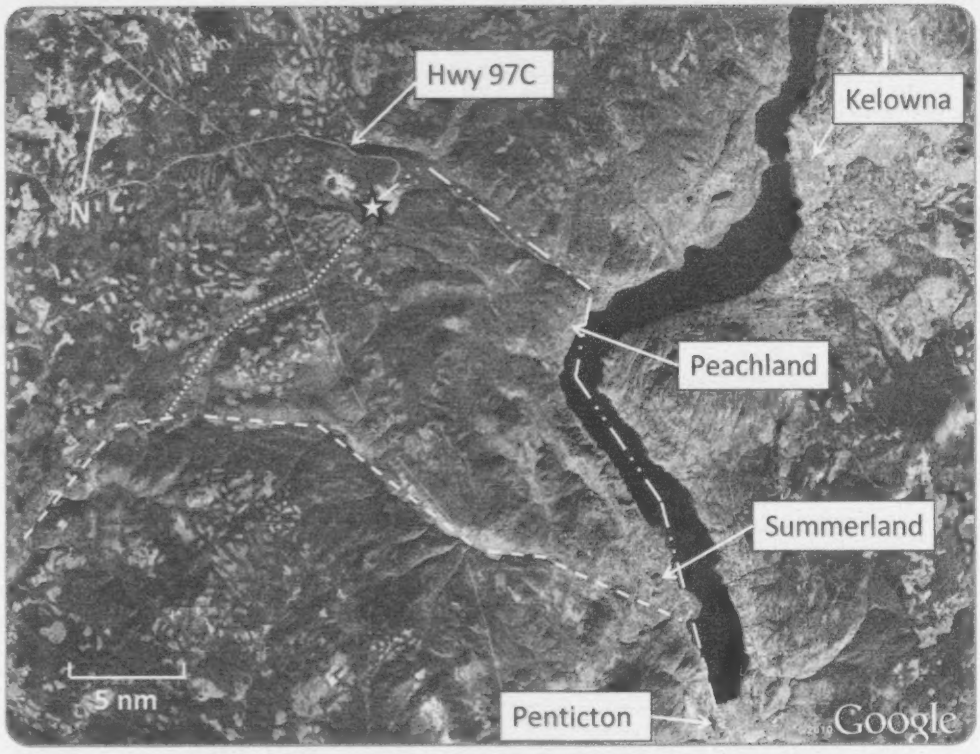
The partially obstructed fuel nozzle prevented the right engine from producing as much power as the left engine. The exact amount of power reduction could not be determined, but the aircraft's climb performance on the day of the accident was far lower than the figures stated in the pilot's operating handbook. The fuel flow indicator showed that the right engine's fuel flow was higher than the left engine's, when in fact it was lower. As a result of that incorrect indication and the normal rpm and manifold pressure indications, it is likely that the pilot did not recognize the problem or its consequence.

The high density altitude conditions, high aircraft weight, non-use of available turbochargers and reduced power of the right engine all contributed to a reduced rate of climb.

Likely accident scenario

Although the pilot observed that the aircraft's rate of climb after takeoff from Penticton was lower than anticipated and was aware that climbing to an altitude of 5 000 ft before turning west toward high terrain was recommended, the pilot turned west at a lower altitude. The pilot continued flying up the valley toward an area of higher terrain in an aircraft that had reduced performance.

The pilot decided to conduct the flight despite being aware that visibility to the west (the flight planned route) was reduced by smoke. Reduced visibility was almost certainly encountered in the vicinity of Brenda Mines.



Map showing the probable route up the lake to the accident site (dashed/double-dotted line), the published VFR route to the west of the lake (dashed line) and the low ground route connecting the two (dotted line)

Neither survivor recalled the final moments of the flight. There were no other witnesses to the crash, and there were no on-board recording devices. The last time the aircraft was seen by a witness, about 2 NM from the accident site, it was climbing slowly and was nearly at the same altitude as the accident site. It is not known why the pilot chose the accident flight path instead of a path slightly to its left that would have kept it over lower, unobstructed ground, but it is likely that visibility was reduced so that the pilot was unaware of the safer route.

The small number of trees that were damaged, the short length of the impact swath and the relative intactness of the wreckage indicate that the aircraft was travelling at slow speed at the time of impact. Damage to the trees and to the wings' leading edges indicates that the aircraft was descending in a 45° right wing-low bank when it struck the trees. If the aircraft had been descending in this attitude for more than a few seconds, it is likely that the speed at impact would have been higher. It is therefore likely that the aircraft was flying at a relatively low altitude in lowered visibility over the trees just before impact. The low altitude above terrain would not have allowed sufficient room to manoeuvre, and the aircraft descended into the trees.

Pilot decision-making

The pilot had earned a commercial pilot's licence and several endorsements, but had relatively little experience. As well, although the accident aircraft was fairly sophisticated—twin engine, turbocharged, with retractable gear and an autopilot—it was privately owned and operated, which meant that the pilot did not have the organizational support that a student or a pilot flying for a commercial operator would have. This support includes resources such as co-workers' experience, co-pilot or instructor's assistance, managerial supervision, recurrent training and company maintenance programs.

It is likely that the pilot had previously experienced each of the factors that contributed to the aircraft's low rate of climb—high density altitude, high aircraft gross weight and degraded engine power—but it is unlikely that the pilot had dealt with all of them at the same time before the accident flight. As stated in the Transport Canada publication *Pilot Decision Making* (TP 13897), flying is a continuous process of decision-making. The process begins before the flight, when the pilot makes a plan that will result in a safe flight, and it continues throughout the flight, as the pilot monitors the results to determine whether the plan is working as anticipated. If it is not, the pilot needs to be able to revise the plan as necessary, often quickly. If the pilot does not recognize a situation that necessitates a change of plan or does not have an alternative plan, risk increases.

Findings as to causes and contributing factors

1. The high density altitude conditions, high aircraft weight, non-use of available turbochargers and reduced power of the right engine all contributed to a reduced rate of climb.
2. The pilot continued toward an area of higher terrain, and the aircraft was unable to climb rapidly enough to provide adequate terrain clearance.
3. The aircraft collided with terrain, likely while in an area of reduced visibility.

Findings as to risk

1. There is an increased risk of injury to occupants if the aircraft is not equipped with shoulder harnesses.
2. If maintenance activities are not properly documented, an opportunity to correctly diagnose and rectify defects is lost.

Safety action taken

Transport Canada and NAV CANADA

NAV CANADA has issued a *Canada Flight Supplement* amendment for the Penticton, Oliver and Osoyoos Airports in the Okanagan Valley. The following warning has been added to the caution sections of these airports:

> *"Due to high terrain, it is recommended pilots proceeding E or W under VFR, maintain an alt of 5,000 feet (ASL) min before leaving the Okanagan Valley."*

The 25th edition of the NAV CANADA Vancouver VFR navigation chart (VNC), effective August 22, 2013, includes the new VFR route, as suggested by Transport Canada, between Princeton, Brenda Mines and Highway 97C to Okanagan Lake. An associated caution reads as follows:

-CAUTION-
VFR ROUTE VALLEY FLOOR HAS
STEEP GRADIENT TO 4500 FEET ASL
WITHIN 10NM OF OKANAGAN LAKE

Penticton Airport

The following sign was installed at Penticton Airport, advising pilots to climb to 5 000 ft before turning west or east when departing the Okanagan Valley. △

NOTICE TO PILOTS	AVIS AUX PILOTES
Due to high terrain surrounding this airport, it is recommended that pilots proceeding east or west under VFR, attain an altitude of 5,000 feet (ASL) minimum before leaving the Okanagan Valley.	En raison de l'élévation des terrains entourant l'aéroport, nous recommandons aux pilotes se dirigeant vers l'est ou l'ouest sous VFR, d'atteindre une altitude minimale de 5000 pieds (ASL) avant de quitter la vallée de l'Okanagan.
Airport Elevation is 1,129 feet (ASL)	Altitude de l'aéroport est 1,129 pieds (ASL)

Modified sign at Penticton Airport

When you push the weather and get into trouble, remember who put you there.

New Advisory Circular: Prevention and Recovery from Aeroplane Stalls

Transport Canada recently issued Advisory Circular (AC) No. 700-031, titled "*Prevention and Recovery from Aeroplane Stalls*".

The purpose of this document is to provide guidance to operators, pilots, flight crews and Transport Canada personnel for the prevention and recovery from stall events. It provides best practices and guidance for training, testing, and checking within existing regulations, to ensure correct and consistent responses to unexpected stall warnings and stick pusher activations.

The AC emphasizes reducing the angle of attack (AOA) as the most important response to a stall event. This AC also provides guidance for operators and training providers on the development of stall and stick pusher event training. For complete details, please consult the AC 700-031 linked above.

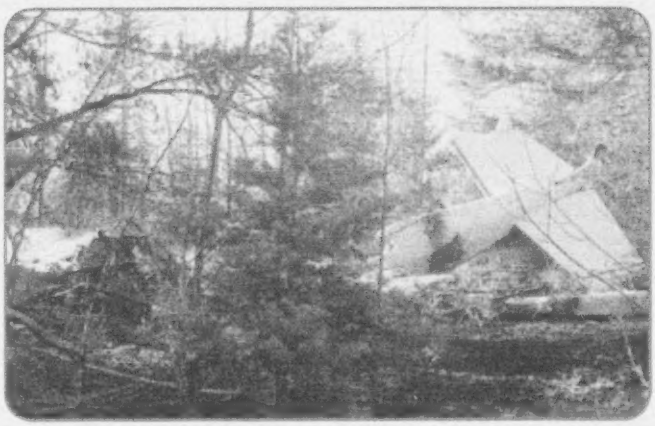
Note: *The following accident synopses are Transportation Safety Board of Canada (TSB) Class 5 events, which occurred between May 1, 2013, and July 31, 2013. These occurrences do not meet the criteria of classes 1 through 4, and are recorded by the TSB for possible safety analysis, statistical reporting, or archival purposes. The narratives may have been updated since publication. Unless otherwise specified, photos are provided by the TSB. For more information on any individual occurrence, please contact the TSB.*

— On May 2, 2013, an amateur-built Glastar took off from Chilliwack Airport (CYCW), B.C., and stayed in the circuit for a touch-and-go. On climb-out following the touch-and-go, the engine (Lycoming IO-360-B1B) rpm only increased to about 1 700 rpm despite application of full throttle. The pilot radioed that he had an engine problem and was returning to land. Although the engine continued to run smoothly, it would not exceed 1 700 rpm; as a result, the circuit was flown at a lower than usual altitude and airspeed. When the aircraft turned base, the pilot noticed an aircraft positioning for takeoff and decided to abort the landing and continue flying north over farmland toward the Fraser River. About 2 NM north of Chilliwack Airport, the engine suddenly went to idle but continued to run smoothly. A forced landing was conducted in a field and the aircraft struck a fence post. The aircraft was substantially damaged; the pilot and passenger received minor injuries. *TSB File A13P0074.*

— On May 2, 2013, a Mooney M20S touched down with its landing gear unintentionally retracted on Runway 22 at Swift Current Airport (CYYN), Sask. The aircraft slid along the runway incurring damage to the underbelly, lower cowling, flaps and propeller. There were no injuries to the two occupants. The runway was closed by NOTAM while the aircraft was lifted and removed from the runway. *TSB File A13C0042.*

— On May 4, 2013, a Bilsam Sky Cruiser ULA advanced ultralight from Barrie, Ont., was landing at Lachute Airport (CSE4), Que., when the pilot's right foot slid off the right rudder pedal which resulted in an abrupt and strong push on the left rudder pedal. The nose wheel broke and the aircraft slid on its nose towards the left of the runway. The propeller broke against the runway. The pilot was alone on board and was not injured. *TSB File A13Q0076.*

— On May 4, 2013, a Cessna 185F took off from Runway 25 at Mont-Laurier aerodrome (CSD4), Que. with a pilot on board. Runway marks made by the left wheel extended into the sand located off the runway, indicating that the aircraft had left the runway before taking flight. Once in flight, the aircraft banked left, crashed nose first in the opposite direction and caught fire. The pilot was killed. The TSB sent the seat to the laboratory for further analysis. *TSB File A13Q0077.*



Cessna 185F at Mont-Laurier on May 4, 2013

— On May 5, 2013, a Zenair CH701 had completed an hour of touch-and-gos at Lachute Airport (CSE4), Que., and was taxiing on the ground towards the parking area. While taxiing, the main gear collapsed and came to a stop without other incident. An examination of the gear indicated that the gear's spring leaf attachment bolts gave way and allowed the fuselage to collapse on its belly. *TSB File A13Q0080.*

— On May 12, 2013, a Bell 212 helicopter was on a VFR flight, from the FOX-3 radar site (3 NM NW of Dewar Lakes, Nun.) to Hall Beach (CYUX), Nun., with a pilot and four passengers on board. As the helicopter left the helipad surface after takeoff, it encountered a severe snowball effect and all visual references were lost. The aircraft impacted the snow-covered surface approximately 300 m from the helipad and rolled over. Two of the four passengers suffered minor injuries. The helicopter was destroyed. *TSB File A13C0048.*

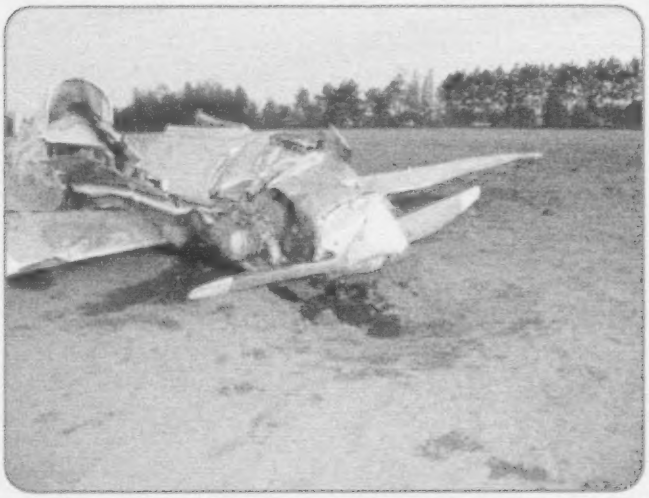
— On May 13, 2013, a Cessna 205 was being run up after maintenance by an aeronautical maintenance engineer (AME) on the apron at Anahim Lake Airport (CAJ4), B.C., when the aircraft flipped over its nose. It was reported that the aircraft had a 5 kt tailwind and was just powering up (about ½ throttle) when a whirlwind gust caught under the tail. The AME was alone on board and was not injured, but the aircraft was substantially damaged. *TSB File A13P0080.*

TSB File A13P0080

— On May 14, 2013, the pilot of a Piper PA-12 was on the final leg of a cross-country flight that had originated in Colorado. The final leg of the trip was from Lethbridge (CYQL), Alta., to Vermillion (CYVG), Alta. The last fuel stop had been in Fort Benton, Mont., where the aircraft obtained full fuel. While in cruise at 4 500 ft, approximately 35 NM south of Vermillion, the engine lost power. The propeller continued to windmill as the pilot attempted to glide to CFB Wainwright Field 21 (CFP7), Alta. When it was apparent that the aircraft would not make the field, the pilot lined up on a gravel road. While on short final, at about 30 ft above ground, the aircraft hit a power line, resulting in a hard landing. The aircraft was substantially damaged and the pilot, who was the sole occupant, received minor injuries. The maintenance company that performed the recovery drained 3 L of fuel from the aircraft fuel tanks. There were no signs of fuel leaks at the accident site. *TSB File A13W0060.*

— On May 18, 2013, a Cessna 172 RG was on a training flight and, when selected up, the gear failed to indicate up and locked. During the subsequent approach, the down lock indicator did not illuminate to show down and locked. A visual check of the landing gear showed no gear down on the right side. The aircraft did a flyby of the tower that confirmed that the nose and left landing gear appeared to be down and locked, while the right landing gear was in the trailing position. After several attempts to extend and retract the landing gear, the aircraft carried out a landing with the nose and one main landing gear down and locked. The aircraft landed and the right gear did not support the weight of the aircraft, which subsequently ground-looped and settled onto the right horizontal stabilizer and right wing tip. The aircraft was substantially damaged and there were no injuries. Maintenance found a fracture in the housing of the hydraulic rack-and-pinion type landing gear actuator that prevented it from functioning properly. *TSB File A13O0095.*

— On May 18, 2013, an amateur-built Hummelbird aircraft was conducting a local VFR flight from Mascouche Airport (CSK3), Que., in clear and calm weather conditions. While the aircraft was above Lavaltrie, Que., the pilot made a distress call without specifying the nature of his difficulties. The aircraft crashed at an impact angle of about 60° into a sandy field. The pilot suffered fatal injuries. The aircraft was substantially damaged but the propeller was relatively undamaged. The engine was taken to a TSB laboratory for assessment. *TSB File A13Q0086.*

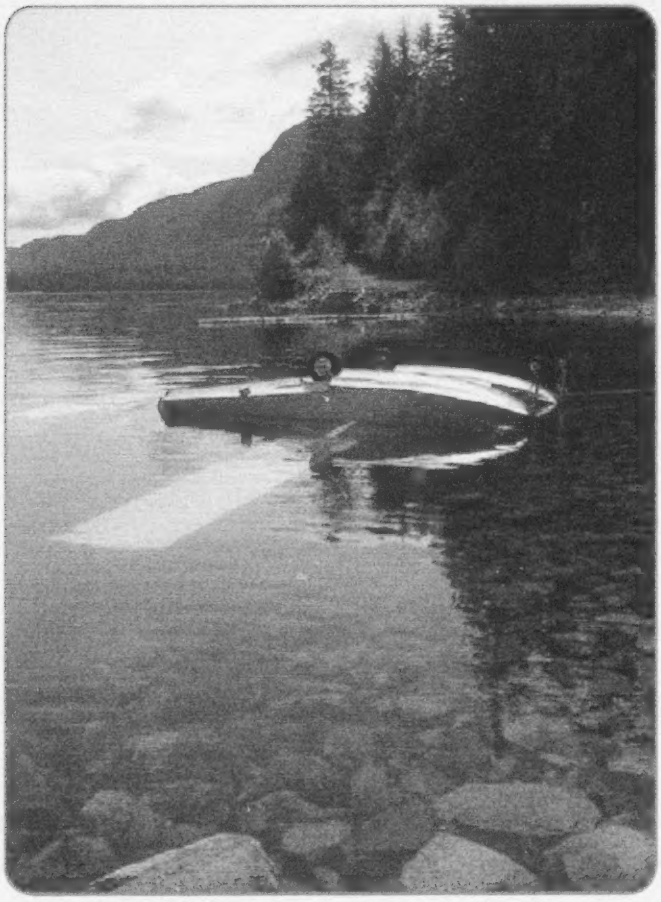


Hummelbird amateur-built, May 18, 2013

— On May 19, 2013, an AS350-B2 helicopter was landing on a site at the edge of a muskeg approximately 45 NM NW of Fort McMurray Airport (CYMM), Alta. The pilot landed the helicopter and performed a "seating check". Having determined that the site was suitable, the landing and normal shutdown were completed. During the shutdown, the passengers began to unload their equipment from the port side equipment basket. The aircraft began to tilt aft and to the left during the unloading. With the passengers waiting by the tree line, the pilot attempted to restart the aircraft for repositioning. The main rotor blades did not turn much when fuel was added, so the aircraft was shutdown. An attempt was made to prop up the helicopter by placing logs under the skids. A second restart was then attempted; however, the helicopter began to shake and the start was aborted. A post shutdown inspection indicated that damage had been sustained to the tail boom and tail rotor blades when they contacted the water. *TSB File A13W0063.*

— On May 21, 2013, a sunken DHC-2 Beaver was discovered by hunters in the water near Stuart Island, in the mouth of Bute Inlet, B.C. (25 NM N of Campbell River, B.C.) after they spotted a pair of aircraft floats upside down. The joint rescue coordination centre (JRCC) in Victoria was alerted at 17:23 PDT, and a rescue helicopter on a training flight in the area was tasked to respond and arrived at the site at

17:45 PDT. The one person on board was confirmed deceased. The aircraft was equipped with a 406/121.5 MHz emergency locator transmitter (ELT), but no transmission was received or reported by others. *TSB File A13P0086.*



Sunken DHC Beaver on May 21, 2013 near Stuart Island, B.C.

— On May 25, 2013, a Cessna 180K on floats, with an instructor and a privately licensed student on board, was performing cross-wind landings in the Georgian Bay, 8 NM W of Parry Sound, Ont., as part of the student's training to obtain a float endorsement. After several cross-wind takeoffs, they flew an approach in a NE direction with the wind reported from the WNW at 5–15 kt. Visibility during the flight was unlimited, and the landing was to take place in the leeward side of an island where the water surface was calmer. After a briefing from the instructor, the student remained as the pilot flying and selected 20° of flap. The approach was stable, but when the aircraft touched down on the water the left float dug in and the aircraft veered to the left and became inverted. The instructor tried to take control of the aircraft but was unable to right the aircraft before it became inverted. The student and instructor were wearing shoulder harnesses and, after the aircraft stopped, they released themselves from the harnesses and both exited the aircraft through the right cabin door. The aircraft came to rest approximately 50 ft from a small island. Although both retrieved life jackets from the aircraft, they decided the distance to shore was minimal and carried the life jackets instead of wearing them. After a short period of time, a boat passed by and called rescue services. Neither pilot was injured; the aircraft sank in approximately 10 ft of water. *TSB File A13O0099.*

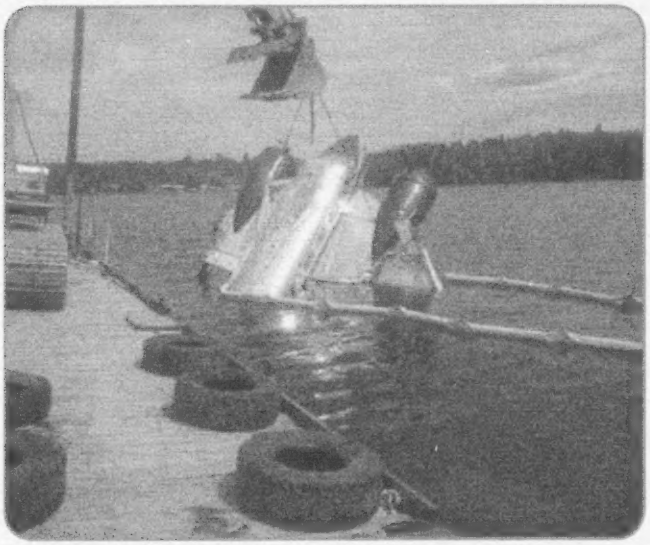
TSB File A13O0099

— On May 28, 2013, a Delta Trikes Aviation J-RO 914 UL gyroplane, with the owner/student pilot on board, took off from a grassy area off the left side of Runway 24 at St-Lambert- de-Lauzon aerodrome (CST7), Que., in order to conduct a local flight. This grassy area is often used by aircraft such as gyroplanes and ultralights. During the climb, control was lost and the aircraft crashed about 2 000 ft from the threshold of Runway 24, 150 ft southeast of the runway.

The pilot died in hospital. The aircraft was destroyed by the impact but there was no post-crash fire. Two TSB investigators went to the accident site. The reasons for the loss of control are not yet known. *TSB File A13Q0089.*

Gyroplane accident at the St-Lambert- de-Lauzon aerodrome

— On May 30, 2013, a float-equipped Beech 18 was departing Cochenour (Red Lake), Ont., en route to McCusker Lake, Ont., on a camp service flight with a pilot and one passenger on board. On departure, the aircraft banked slightly right then 90° left. The left wing tip struck the water, and the aircraft cartwheeled and sank. The two occupants sustained fatal injuries; the aircraft was substantially damaged. *TSB File A13C0058.*



Beech 18 being recovered out of Red Lake, Ont.

— On May 30, 2013, a privately owned Piper PA-34-200T was climbing after takeoff from St. Thomas Municipal Airport (CYQS), Ont., when a landing gear unsafe light illuminated. After a flyby with ground personnel observing, it was determined that the nose wheel was turned 90° from the direction of flight. The pilot declared an emergency and on touchdown the main landing gear contacted the runway first, with the nose pitched high until speed was reduced. When the nose gear dropped to the runway, it collapsed. The two propellers struck the runway surface. The aircraft came to a stop on the runway and the pilot exited the aircraft uninjured. It was determined that, before the flight, the aircraft had been towed. To facilitate towing, the aircraft's scissor pin was removed to prevent nose gear damage during towing. The pin was not reinstalled and its absence went unnoticed. *TSB File A13O0102.*

— On May 31, 2013, a float-equipped Bellanca 7GCBC with two people on board was on a VFR flight from Lac Casey to Lac Cloutier, Que. While the aircraft was at cruising altitude, about 5 NM from Sainte-Émélie-de-l'Énergie, the engine (Lycoming 0-320-A2D) stopped because of a fuel shortage. The pilot saw a lake where he attempted to land on water. The lake was too small; the aircraft bounced and ended up in the woods. The two people were uninjured and were able to evacuate from the aircraft. The pilot communicated his position by satellite telephone and they were rescued later that evening. *TSB File A13Q0090.*

— On June 3, 2013, a Robinson R44 helicopter was being operated in support of well site servicing activities. The flight originated in Grande Cache (CEQ5), Alta., and was approximately 24 NM east en route to a gas plant when deteriorating weather conditions were encountered. The pilot elected to divert to a nearby gas plant and subsequently came into contact with trees while manoeuvring. The helicopter collided with terrain and was destroyed by post-impact fire. The pilot was able to exit the helicopter but sustained serious injuries. He was transported to Grande Prairie hospital by an air ambulance. *TSB File A13W0073.*

— On June 3, 2013, a Stinson 108-2 on floats was taxiing on the water for departure from Arnprior (CNB5), Ont. During taxi, the wind weather cocked the aircraft, and the pilot was unable to shutdown the engine before the propeller came into contact with a Cessna 172 floatplane, which was parked at the dock. The Cessna suffered significant damage to the rudder, vertical stabilizer and elevator. The Stinson suffered minor scratch damage to the propeller. The pilot and sole occupant of the Stinson was uninjured. *TSB File A13O0106.*

— On June 4, 2013, a Cessna 185F was on a VFR flight from St-Hubert Airport (CYHU), Que., to Lac-à-la-Tortue (CSL3), Que. The pilot decided to conduct a few touch-and-gos at Trois-Rivières Airport (CYRQ), Que. During the second touch-and-go on Runway 23, with a 250° crosswind blowing at 10 to 15 kt, the aircraft suddenly found itself perpendicular to the runway. The aircraft was lifted up and then turned on its back. The pilot sustained a minor cut to one hand and the aircraft's wings and fin were substantially damaged. *TSB File A13Q0091.*

— On June 5, 2013, a Robinson R44 II helicopter was returning after a local VFR flight in the vicinity of Lac Matonipi, Que. The weather conditions were 5–6°C, cloudy with strong winds and no precipitation. During the landing manoeuvre, the aircraft was carried off course by the wind and the main rotor struck trees. The aircraft's main rotor, tail boom and tail rotor were substantially damaged. The pilot, alone on board, was not injured. *TSB File A13Q0104.*

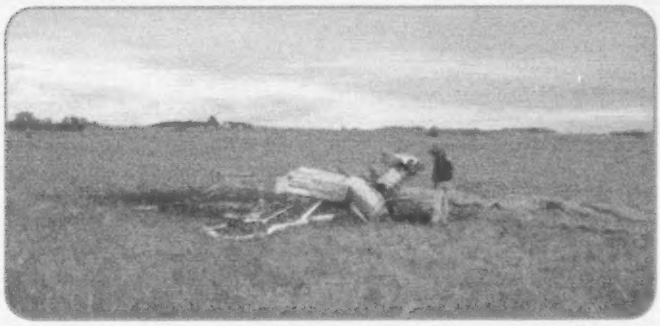
— On June 5, 2013, a Diamond DV20 was on a local training flight at the Greater Moncton International Airport (CYQM), N.B., with a student pilot and flight instructor on board. During the accident flight, the student pilot was practicing an engine failure on takeoff. The instructor had previously briefed the student on the manoeuvre. During the initial climb, the instructor simulated the engine failure by reducing the power

to idle while simultaneously stating simulated engine failure. Initial reaction by the student was delayed, and the instructor took control of the aircraft. There was insufficient altitude available to allow the instructor to fully recover the aircraft. The aircraft impacted the runway with sufficient force to cause the propeller and right wing tip to strike the runway as well as to cause extensive damage to the nose and right main landing gear. There were no injuries. *TSB File A13A0059.*

— On June 6, 2013, an amateur-built Protech PT2 on floats took off from Lac Laganière, Que., for Lac Caché, Que., near Chibougamau, Que., with two pilots on board. When the aircraft was above Lac Chibougamau, the pilot decided to conduct touch-and-gos. At about 1 000 ft AGL, during a left turn, the aircraft started to slide leftwards and nose down. The floatplane hit the surface of the water at an angle of about 30°, nose down. The two occupants escaped through the doors and were rescued by local residents. The aircraft was substantially damaged and the occupants sustained minor injuries. *TSB File A13Q0094.*

— On June 12, 2013, a Cessna C337B with one person on board was reported overdue to Pacific radio/Kamloops flight information centre (FIC) by SPOT satellite tracking service. The joint rescue coordination centre (JRCC) was then notified of the overdue aircraft which had departed Nelson (CZNL), B.C., at 2000Z for La Ronge (CYVC), Sask. The last position registered by SPOT was at 2053Z. JRCC Victoria reported that the aircraft was located near Rose Pass summit (Crawford Creek valley) at about 6 500 ft ASL and that the pilot was deceased. Although the weather was reported to have been fair in Nelson and other nearby areas, extremely poor weather was reported in the upper Crawford Creek valley. *TSB File A13P0112.*

— On June 13, 2013, a Piper PA-14 was departing North Battleford/Cameron McIntosh Airport (CYQW), Sask., en route to Calling Lake, Alta. Shortly after takeoff, the aircraft banked into a turn, descended and struck the ground. A post-impact fire ensued. First responders reached the scene shortly after the accident occurred. The two occupants were deceased and the aircraft was destroyed by impact forces and fire. *TSB File A13C0063.*



TSB File A13C0063

— On June 14, 2013, a Bell B205A-1 helicopter was on approach while working in a firefighting operation west of Daniel-Johnson Dam (formally known as Manic 5), in the regional county municipality of Manicouagan, Que., when the pilot heard unusual noises and got a master caution warning light from the input quill/freewheel system. The pilot completed an emergency landing in a swamp area. The power shaft and freewheeling unit were found ruptured, and debris had been thrown into the engine inlet compressor. There was no post-accident fire. *TSB File A13Q0100.*

— On June 15, 2013, a Zenair Zodiak ultralight was undergoing a test flight from Runway 36 at Muskoka Airport (CYQA), Ont., after the installation of vortex generators. The aircraft became airborne, began oscillating uncontrollably and impacted the runway surface, causing the left main gear to collapse with subsequent runway excursion. The pilot, the sole occupant, was uninjured. The damaged aircraft was removed and the runway reopened. *TSB File A13O0118.*

— On June 16, 2013, a float-equipped Piper PA-18S was on approach for Lac des Passes, Que., with a pilot and a passenger on board. While the pilot was making a turn for a landing on water, the aircraft lost too much speed and altitude. The left float hit the surface of the water and the aircraft nosed over. The aircraft was found upside down in about 6 ft of water.

The floats jutted out from the surface. The pilot was able to evacuate from the submerged aircraft through the main door while the passenger used the window on the left. They were immediately rescued by fishers and were transported to hospital by ambulance. *TSB File A13Q0101.*

— On June 20, 2013, a Lake LA-4-200 Amphibian was on a local VFR flight in the vicinity of Trois-Rivières Airport (CYRQ), Que. During the landing run, the two legs of the main landing gear collapsed and the aircraft slid on the runway over approximately 120 m before coming to a stop. The pilot, alone on board, was not injured. The aircraft's hull was damaged. According to the engineers who repaired the aircraft after the accident, it seems that the gear was deployed before there was sufficient hydraulic pressure to ensure locking in the down position. Gear deployment and retraction tests after the accident showed that the gear and the position indicating and locking system worked properly with adequate hydraulic pressure. *TSB File A13Q0105.*

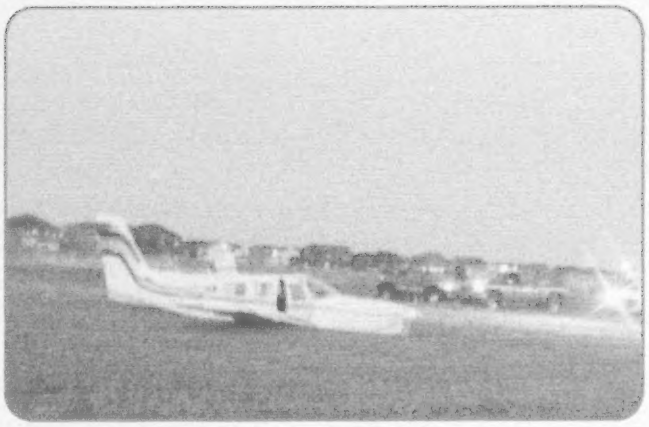
— On June 23, 2013, a Paratour SD-2 powered paraglider was on a flight in the vicinity of Saint-Édouard-de-Lotbinière, Que. The aircraft was seen spiraling and crashed not far from the intersection of Route 226 and Route Soucy. The pilot was seriously injured. *TSB File A13Q0107.*

— On June 23, 2013, a privately operated Lake Buccaneer (LA-4-200) was departing from Kootenay Lake, West Arm (7 NM NE of Nelson, B.C.), with two persons on board. During the takeoff run, the aircraft struck the wake generated by a passing boat, lifted off, bounced once and struck the water in a nose-down attitude. The occupants exited the aircraft which subsequently sank. There were no injuries. Both occupants were wearing 3-point safety harnesses and inflatable personal floatation devices (PFD). One occupant inflated the PFD before exiting the aircraft but was not hindered by it. *TSB File A13P0124.*

— On June 24, 2013, a DHC-2 MK1 Beaver was en route at 2 000 ft ASL from Toba Inlet, B.C., to the river at YVR. Approximately a third of the way into the trip, the engine suffered a catastrophic failure and the propeller departed the aircraft, damaging both of the floats. The pilot conducted a forced landing near Halfmoon Bay, B.C. There were no injuries. The aircraft was towed to shore and tied to a dock. The engine was shipped to the American facility that had performed the last overhaul, and a NTSB investigator represented the TSB at the tear down. The damage was so extensive that it could not be determined what had failed. *TSB File A13P0123.*

— On June 29, 2013, a privately owned, amateur-built Cyclone C 180 on floats was taxiing on the water for a departure from Saganash Lake, Ont. The wind on the lake was reported as strong. During a left turn, the left wing began to rise and the right wing tip entered the water. The aircraft quickly rolled over and submerged, coming to a rest upside down suspended by the floats. The pilot, sole occupant on board, was able to egress without difficulty or injury and was assisted by a nearby boat. *TSB File A13O0122.*

— On July 1, 2013, a Piper PA-32RT-300T (Turbo Lance II) was arriving at Okotoks (CFX2), Alta., from Elko (CBE2), B.C., when the engine began to lose power while downwind for Runway 16. The pilot switched fuel tanks with no change. With insufficient power to maintain altitude, the pilot conducted a successful forced landing in a stubble field approximately 1 km north of the airport. Two passengers and two dogs exited the aircraft, and additional fuel (approximately 30 L) was added for an attempt to reposition the aircraft to the airport. Shortly after becoming airborne from the stubble field (1 ft stubble), the aircraft struck a chain-link fence and landed heavily short of the runway, resulting in substantial damage to the aircraft. The pilot sustained injuries. *TSB File A13W0090.*



TSB File A13W0090

— On July 2, 2013, a DHC-2 Beaver floatplane, a charter flight with one pilot, two passengers and two dogs on board experienced a hard landing at sea in the vicinity of Escalante Point on the northwest coast of Vancouver Island, B.C. On touchdown, as the speed decreased, the aircraft impacted with two successive heavy sea swells. The water poured over the front floats. The forward struts were fractured, the engine mounts collapsed and the floatplane came to a stop pointing about 20° nose down. The pilot called company operations and another aircraft overflew the area. Kamloops area control centre (ACC) and flight information centre (FIC) were advised. The pilot and passengers donned life preservers and fitted the dogs with the same. Shortly afterwards, a Coast Guard vessel arrived and all were transferred onto the vessel. By that time, the airplane was pointed straight down and drifting toward the rocky shoreline. Minor injuries were reported; the aircraft sustained substantial damage. *TSB File A13P0130.*

— On July 5, 2013, a Hughes 369D (500D) helicopter was operating 5 NM NW of Fort Saskatchewan, Alta., in support of the construction of a 500 kV transmission line. While hovering next to a lattice tower, the main rotor blades struck the tower structure and control of the helicopter was lost. The helicopter crashed near the base of the tower, and the pilot and lineman both received serious injuries. The helicopter was substantially damaged; there was no post-impact fire. *TSB File A13W0093.*

Downed helicopter near Fort Saskatchewan, Alta.

— On July 11, 2013, a Piper PA-44-180 aircraft was conducting stop-and-go circuits on Runway 30 at Sault Ste. Marie Airport (CYAM), Ont., with one instructor and two students on board. During the occurrence landing, the student retracted the flaps as the aircraft was slowing down and inadvertently retracted the landing gear at the same time. The aircraft right main landing gear and nose landing gear retracted. The right wing suffered damage and the propellers on both engines struck the ground. There were no injuries. *TSB File A13O0134.*

TSB File A13O0134

— On July 11, 2013, a Piper Aztec PA-23-250 was returning to Montreal/St-Hubert Airport (CYHU), Que., after a multi-engine pretest flight. Upon touching down on Runway 06L, the landing gear collapsed. The aircraft slid for approximately 600 ft before coming to a stop. There were no injuries to the student pilot or instructor on board. The aircraft was substantially damaged. Examination of the aircraft did not show any faults. The gear down selection was made just prior to touching down on the runway; the gear had not extended and locked before touchdown. Sections of the checklist were revised and changed to include confirmation of the three green gear down and locked condition. *TSB File A13Q0120.*

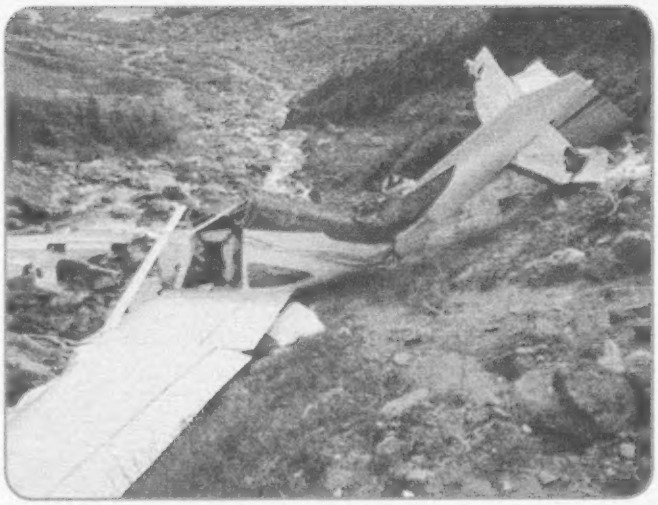
— On July 13, 2013, a privately owned Cessna 150K took off from Mascouche, Que. to Trois-Rivières, Que., for a training flight with a student pilot on board. At 2 200 ft ASL, the engine (Continental O-200-A) lost power and smoke entered the cabin. In the moments that followed, the engine stopped. The pilot declared an emergency and conducted a forced landing in a field. The aircraft came to a stop in a ditch and was substantially damaged. The pilot was uninjured. *TSB File A13Q0121.*

— On July 14, 2013, an amateur-built, float-equipped Golf Caddy took off on a VFR flight from Lac Blouin, Que., to Lac Corbett, Que., with only the pilot on board. On arrival at his destination, the pilot conducted low altitude orbits to take photos. The aircraft stalled in a low altitude turn and crashed in the trees. The aircraft was substantially damaged. The pilot was unharmed. *TSB File A13Q0122.*

— On July 14, 2013, a Let Kunovice L-33 Solo glider was being towed for a local flight at the Black Diamond/Cu Nim airstrip (CEH2), Alta. Shortly after liftoff, the pilot became aware of a buzzing sound emanating from the front cockpit area. The noise became pronounced by 100 ft AGL; the canopy latch was visually checked and appeared full forward indicating the locked position. The air vent was cycled but no change in noise was detected. At approximately 300 ft AGL, the canopy opened to one third travel. The pilot caught the canopy and slammed it to the closed position. Unable to determine if the latch had failed, the canopy was held in the closed position while aborting the flight and returning to CEH2. Limited to flying with one hand, the flight spoilers would be unavailable for the descent and landing. The pilot conducted side slip manoeuvres to lose altitude. Airspeed was above normal for the landing flare, which resulted in several hard contacts with the runway surface. Left rudder input was applied to avoid a fence beyond the end of the runway. The aircraft turned 90° left and the right wing contacted and remained on the runway surface. The pilot was uninjured but the glider sustained substantial damage. The latch pins were found to be above the pin receivers. *TSB File A13W0097.*

— On July 26, 2013, a float-equipped Cessna 182T departed Cooking Lake (CEZ3), Alta., on a VFR flight plan for Vernon (CYVK), B.C. The flight plan included a one hr stop at Fortress Lake, slightly over half way along the route. At 13:14 PDT, Victoria joint rescue coordination centre (JRCC) received an ELT signal and a search party located the wreckage in the Alnus Creek valley about 8 NM NW of Fortress Lake.

The pilot was deceased. There was no fire. The coroner's office said it is not known why the pilot elected to fly up the Alnus Creek valley. No indications were found of power or control loss prior to impact. Physical evidence was consistent with high power setting upon contact with terrain. High altitude and high air temperatures resulted in high density altitude, factors known to degrade aircraft performance. This accident is consistent with other accidents the TSB has investigated where pilots have intentionally flown into rising terrain, and degraded aircraft performance resulted in the aircraft being unable to stay above the terrain. *TSB File A13P0154.* △



The C182T was equipped with amphibious floats, a Garmin 1000 integrated flight instrument system, a SPOT tracker and a 406 MHz ELT. (Photo: Roger Cross)

DEBRIEF

Know the Tin You're In

The following article was originally published in Issue 3/2002 of Aviation Safety Vortex *and is republished for its enduring value as a safety promotion tool. It should also be pointed out that its message applies to aircraft of all persuasions, not exclusively helicopters.*

We often hear about the dangers of complacency and over the years it's been the subject of countless articles and accident profiles. Usually, the focus of these discussions is on a lack of diligence stemming from familiarity with a task—like flying the same aircraft everyday on the same job. There are other facets to our business, however, which also demand careful attention to detail.

Often, helicopter pilots fly more than one helicopter, and are expected to stay current on several types or models. These skills develop as we gain experience, but the differences between aircraft, even within the same type, can bite you if you're unaware.

Helicopters, like most machines, are in a constant state of change as manufacturers or operators learn from experience, upgrade, or modify to suit operational needs. This can run the gamut from the simple placement of switches to fitting engines from different manufacturers.

Some examples:

- Manual cargo releases may be cyclic or collective mounted, T-handles, or floor pedals. Even within the same type, like the AS350 series, the release may change depending on which hook is installed.
- Power instruments—we have percent torque, PSI torque, pitch angle, differential Ng, first limit indicators, etc.
- Rotor tachs—percent Nr vs. actual RPM.
- Fuel gauges—pounds vs. percent vs. Gallons vs. Litres.
- Many operators change cyclic heads, or the location of Force Trim Release, NAV Standby or Cargo Release buttons.
- Some IFR platforms like the Sikorsky 76 series has almost as many avionics configurations as there are helicopters.
- Emergency floats can be activated by buttons on the collective, triggers, or handles, depending on the installation.

You get the picture. When new to a machine, or when a variety of different aircraft are flown, it is very important to familiarize oneself with each ship. Failure to do so often results in forgotten fuel valves, generators, cross feeds, rotor brakes, or dropped sling loads during normal operations, and can cause critical delays and mistakes when confronted with an emergency. That extra few minutes you take to get acquainted could be the start of a lasting friendship. △

Transport Canada Transports Canada

TAKE FIVE...

TP 2228E-20
(02/2014)

for safety
Five minutes reading could save your life!

PASSENGER SAFETY BRIEFINGS

Why, when and how should pilots present the passenger safety briefing?

Why:

The safety briefing serves an important safety purpose for both passengers and crew.

Briefings prepare passengers for an emergency by providing them with information about the location and operation of emergency equipment that they may have to operate; and a well-briefed passenger will be better prepared in an emergency, thereby increasing survivability and lessening dependence on the crew to assist them.

When:

When passengers are carried, a crew member must provide a standard safety briefing.

How:

An oral briefing by a crew member or by audio or audio-visual means.

Content:

The required standard safety briefing consists of four elements: ***prior to takeoff, after takeoff, in-flight resulting from turbulence and before passenger deplaning.*** An individual safety briefing must be provided to a passenger who is unable to receive information contained within the standard safety briefing, such as visually impaired passengers, hearing-impaired passengers, and adults with infants.

Common problems:

No public address system; too much noise in the cabin, making it impossible for passengers to hear; short flights, leaving no time for in-flight briefing. If you are facing any of these problems, conduct the briefing before the engine start-up and combine the ***after takeoff*** and ***turbulence*** portions with the ***prior to takeoff*** briefing. For example, inform the passengers that seat belts must be fastened during takeoff, landing, turbulence and that it is advisable that seat belts remain fastened during the cruise portion of flight.

The passengers appear uninterested?

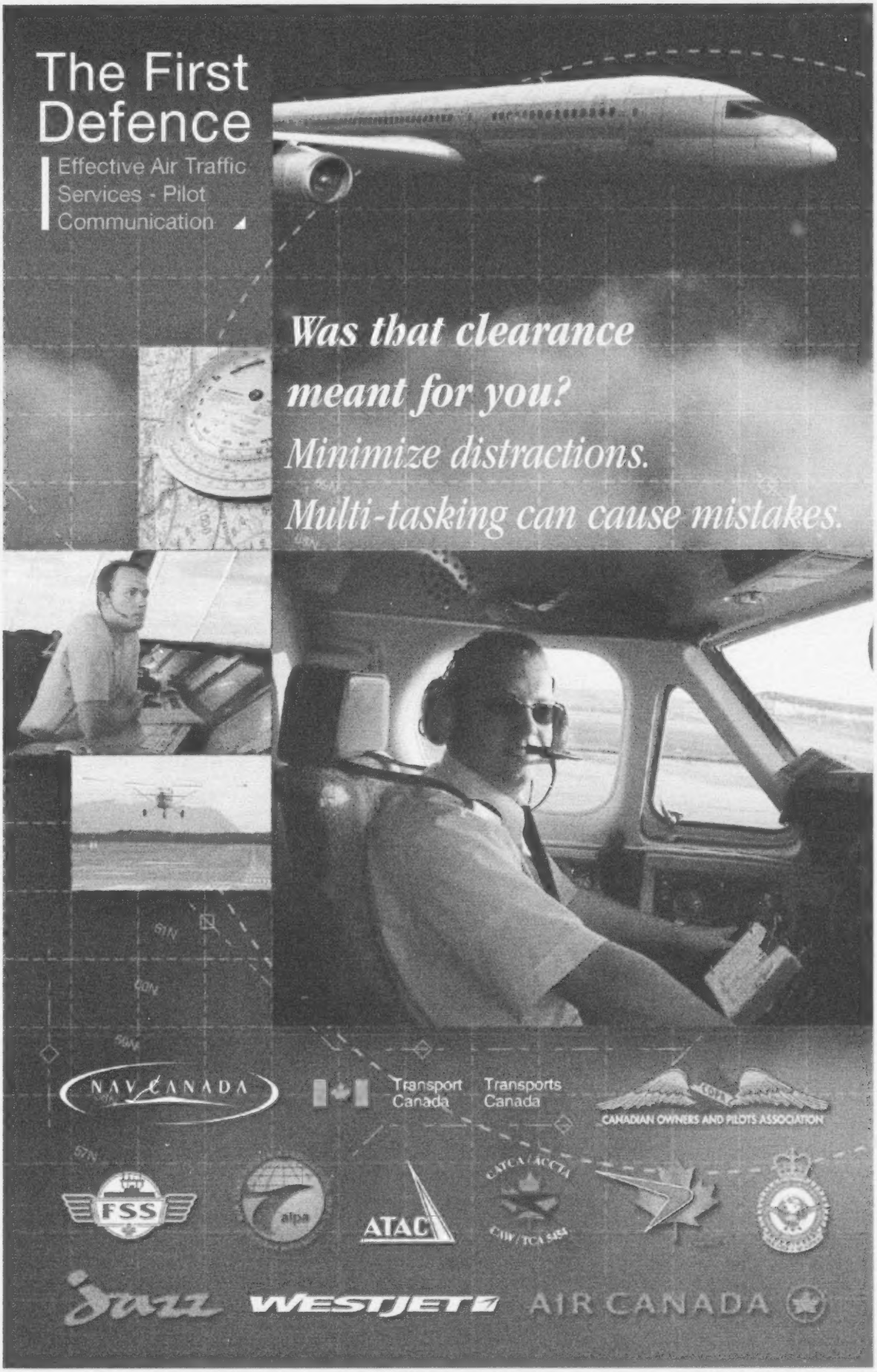
Make the briefing informative and interesting in order to maintain passenger attention. Face the passengers, establish eye contact and speak at a slower-than-normal rate.

Never skip the safety briefing at a passenger's request.

Frequent flier passengers are often unaware that equipment locations and operation can vary on the same aircraft type. The time and effort taken in delivering an effective safety briefing benefits both passengers and flight crew.

To view the complete *Take Five* list, please click here.

Canada


The First Defence
Effective Air Traffic Services - Pilot Communication
Was that clearance meant for you?
Minimize distractions.
Multi-tasking can cause mistakes.
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Transport Canada
Transports Canada
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